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12,215,645 GROSS TONS.

OFFICIAL FIGURES COVERING THE ORE MOVEMENT BY LAKE DURING 1897—RAIL SHIPMENTS WILL MAKE THE OUTPUT PRACTICALLY TWELVE AND A HALF MILLIONS—RECEIPTS AT LAKE ERIE PORTS AND STOCKS ON DOCK.

Official returns from dock managers at all ore shipping ports have been received by the Marine Review, and the shipments by lake are found to foot up 12,215,645 gross tons. Figures covering rail shipments will not be available until the close of the year. Rail shipments will aggregate probably 200,000 tons, and the total output of the Lake Superior mining region will therefore be practically 12,500,000 tons, or full 2,000,000 tons more than the output of 1895, which has been referred to as the 10,000,000-ton year. As compared with 1896, the shipments by lake this year show an increase of 2,571,609 tons. The greatest gain over 1896 is in the movement from Two Harbors, where mines of the Vermilion and Mesabi ranges, controlled mainly by the Minnesota Iron Co., show an increase of 837,473. Increases at Ashland, Marquette and Duluth range from 375,000 to 500,000 tons. Shipments of the several ports during five years past are recorded in the following table:

LAKE SHIPMENTS OF IRON ORE—GROSS TONS.

	1897	1896	1895	1894	1893
Escanaba	2,302,121	2,321,931	2,860,172	1,644,776	2,048,981
Marquette	1,945,519	1,564,813	1,079,485	1,424,850	1,086,934
Ashland	2,067,637	1,566,236	2,350,219	1,738,590	1,117,520
Two Harbors	2,651,465*	1,813,992	2,118,156	1,373,253	903,329
Gladstone	341,014	220,887	109,211	79,208	203,585
Superior	531,825	167,245	117,884	.....	80,273
Duluth	2,376,064	1,988,932	1,598,783	1,369,252	440,592
Total by lake	12,215,645	9,644,036	10,233,910	7,629,829	5,880,918
Total all rail	.....	290,792	195,127	118,394	178,037
Total shipments	.....	9,934,828	10,429,037	7,748,223	6,058,955

* Includes 12,265 tons afloat in vessels at head of lakes.

With the close of the year shipments from all mines in the Lake Superior region will be given in detail. As yet the shipments by mines can be given only in the case of the two Minnesota ranges—Vermilion and Mesabi. These are as follows:

Mine.	Tons.	Mine.	Tons.
Mountain Iron	765,000	Oliver	609,612
Fayal	642,939	Minnesota	592,196
Chandler	438,366	Mahoning	519,892
Biwabik	427,466	Genoa	309,514
Lake Superior	259,910	Pioneer	207,103
Adams	175,800	Auburn	175,263
Norman	101,070	Sparta	66,720
Commodore	60,797	Ohio	47,309
Zenith	40,817	Cincinnati	32,720
Roberts	18,614	Hale	13,728
Cloquet	12,215	Penoscot	11,933

There are in the foregoing list twenty-two mines, the three of the Lake Superior group being counted as one mine. The greatest iron mining totals ever reached by any corporation in the world were made this year by the Minnesota Iron Co., its shipments aggregating 2,259,248 gross tons. Tonnage handled by the Minnesota railroads this year has been as follows: Duluth & Iron Range, 2,651,273; Duluth, Mesabi & Northern, 2,376,063; Duluth, Superior & Western, 531,825 tons.

In the following statement of water shipments by ranges it will be noted that the Mesabi is far in the lead. The Marquette range sent 554,818 tons by way of Escanaba; the Gogebic range, 136,927 tons, and the Menominee range 1,610,376 tons:

	Gross tons.
Marquette Range	2,540,575
Menominee Range	1,911,152
Gogebic Range	2,204,564
Vermilion Range	1,278,481
Mesabi Range	4,280,873
Total water shipments	12,215,645

The following summary of shipments from some of the old-range mines is not absolutely correct, as full returns from the different mines will not be at hand until the close of the year, but the figures are very close to actual amounts: Norrie, 800,000 tons; Lake Angeline, 485,000; Lake Superior, 375,000; Cleveland-Cliffs, 720,000; Republic, 125,000; Tilden, 300,000; Chapin, 556,825; Montreal, 190,000; Aurora, 165,000; Newport, 150,000; Ashland, 105,000; Queen, 212,000; Penn Iron Mining Co., 237,900.

Receipts and Stocks of Ore at Lake Erie Ports.

Complete returns from ore dock managers at all Lake Erie ports have also been received by the Review, and it is found that receipts at these docks foot up 10,120,906 tons, while the amount on dock Dec. 1 was 5,923,755 tons. The 1897 receipts at Lake Erie ports are 2,094,474 tons in excess of 1896, and the amount on dock at present is 968,771 tons in excess of stocks on Dec. 1, 1896.

As shown by figures presented on May 1 of this year there was on dock at Lake Erie ports at the opening of navigation 3,256,497 tons of ore; add to this the receipts during the season just closed, 10,120,906 tons, and we have a total of 13,377,403 tons; deduct 5,923,755 tons, the amount now on dock, and we find that the shipments to furnaces between May 1 and Dec. 1 foot up 7,453,648 tons, against 5,021,146 tons during the same period in 1896 and 6,339,496 tons during the same period in 1895.

It will be noted that there is a difference of 2,094,739 tons in the shipments from upper lake ports and receipts at Lake Erie ports. This difference represents the ore that was moved by water to South Chicago and other points on Lake Michigan. In 1896 the shipments to South Chicago and other points referred to, aggregated 1,631,489 tons, and in 1895 they were 2,121,682 tons.

Following are the tables showing receipts at Lake Erie ports and amounts on dock during five years past:

IRON ORE RECEIPTS AT LAKE ERIE PORTS—GROSS TONS.

PORTS.	1897	1896	1895	1894	1893
Toledo	416,438	301,794	260,730	158,384	145,515
Sandusky	79,792	58,667	12,361	23,043	4,464
Huron	198,231	226,515	146,442	172,775	137,700
Lorain	355,188	191,445	214,219	150,424	165,667
Cleveland	2,456,704	2,313,170	2,312,370	1,624,573	1,260,716
Fairport	1,008,340	941,446	914,617	976,222	792,517
Ashtabula	3,001,914	2,272,822	2,474,791	1,987 722	1,845,738
Conneaut	495,327	327,623	244,967	237,905	203,207
Erie	1,311,526	847,849	811,989	624,438	369,299
Buffalo Tonawanda	797,446	545,101	719,742	395,339	308,238
Total	10,120,906	8,026,432	8,112,228	6,350,825	5,333,061

IRON ORE ON LAKE ERIE DOCKS, DEC. 1—GROSS TONS.

PORTS.	1897	1896	1895	1894	1893
Toledo	194,644	115,959	113,132	96,15	92,911
Sandusky	84,786	59,491	34,375	77,00	78,439
Huron	230,029	200,075	101,000	147,632	89,000
Lorain	317,509	231,288	224,264	223,733	201,632
Cleveland	1,478,355	1,419,311	1,200,792	1,441,785	1,163,930
Fairport	825,312	773,905	605,470	660,980	578,033
Ashtabula	1,835,694	1,441,666	1,301,302	1,439,119	1,296,431
Conneaut	360,895	275,800	292,460	199,365	91,337
Erie	484,871	355,222	335,718	454,233	359,827
Buffalo	111,660	82,267	207,199	94,239	119,170
Total	5,923,755	4,954,984	4,415,712	4,834,247	4,070,710

Average Rate per Ton.

A report to the effect that the Bessemer Steamship Co. has settled with the Oliver Mining Co. (Carnegie interest) on the basis of a 65-cent ore rate for the season just closed, has caused considerable discussion and some misunderstanding regarding average ore rates. The average of daily rates from the head of the lakes for the past season was only 57.2 cents, but this rate must not be taken as the average on all ore moved from the head of the lakes. A very large part of this ore was contracted in the spring at 70 cents for the full season and 60 cents to Oct. 1, so that the average on wild and contract ore, or, in other words, on the entire tonnage moved from the head of the lakes, would be considerably above 57.2. When the tonnage of each of the shipping concerns is secured, and also the average freight per ton paid by each concern, it will probably be found that the average freight per ton paid on all ore moved from the head of the lakes was quite close to 65 cents.

A letter from Capt. Jamieson of the steamer Minneapolis, printed elsewhere in this issue, criticizes the action of the light-house officials in removing gas buoys, light-ships and other aids to navigation from their stations early in the present month, while hundreds of vessels were still engaged in traffic between Lake Michigan and Lake Erie ports, and now that the stranding of the steamer Iosco at Gray's reef in the Straits of Mackinaw is attributed to the removal of the light-ship from that point, it is probable that there will be still further complaint on this score. It is difficult to move gas buoys and light-ships from their stations after winter weather sets in and ice begins to form. With the increased number of gas buoys now on the lakes the light-house officials are also at a disadvantage on account of having only a few vessels to handle them, and the vessels are not in all cases suited to the work. Then, too, there are some owners who would keep their ships going all winter, if they could do so, and expect the government or someone else to provide for their safety. But with all this it would seem that the criticism of Capt. Jamieson is to a certain extent justified under the weather conditions that have prevailed this fall. There is the same trouble almost every year, and it is due in part to transfers of light-house inspectors to and from the lakes. There can be no set time for the removal of these aids to navigation, as conditions of weather differ each year. This year it would seem that the inspectors acted too hastily in a number of cases.

After a very long delay the report of the Lake Erie-Ohio river ship canal commission of Pittsburg is at hand. It is a very neat volume of some 250 pages, accompanied by several maps and engravings of lake ships, Ohio river barges, etc. Two or three of the pictures represent large numbers of barges or scows on the river at Pittsburg loaded with coal and awaiting a rise in the river to float down stream, although their draft is not more than a few feet. This spectacle is not very encouraging to a scheme for a canal in which it is proposed to float lake ships. The report is well prepared and neatly bound, and the handsome book will undoubtedly be used in an effort to secure a first installment of the appropriation of $10,000,000, which Congressman Dalzell will try to obtain from the federal government. But the scheme is so utterly devoid of merit that it will probably not be heard of in Washington after Mr. Dalzell's bill has been introduced and referred to a committee.

AVERAGE LAKE FREIGHTS.

MARKED REDUCTIONS AS COMPARED WITH PREVIOUS YEARS — FIGURES IN ALL LINES ARE THE LOWEST EVER RECORDED—TABLES OF RATES FOR TWENTY YEARS PAST.

An exhaustive summary of lake freights, prepared by the Marine Review, shows the effect of 6,000-ton ships on carrying charges. Rates on ore, grain and coal, the principal items of freight, are the lowest ever recorded. Improved rates during the closing months of 1897 helped to advance the averages for the season, but as compared with 1896, which was not a very profitable year with most vessels, there is still a marked difference in all lines of freight. Vessels that had contracts at 70 cents a ton for moving ore from the head of the lakes to Ohio ports were certainly very fortunate, as the average of daily rates from the head of the lakes was only 57.2 cents. The few season contracts that were made on ore from Marquette were at 65 cents. The average of daily rates from that port was 54.6 cents. Before the season opened, a number of vessels that had interests in common with ore concerns secured Escanaba contracts at 50 and 55 cents, but 45 cents was the rate governing the only Escanaba contract in which ore interests were not concerned. The average of daily rates from Escanaba was 45.3 cents. The ore dealers were the principal gainers by the low rates that prevailed during spring and summer months. They moved the great bulk of their ore before heavy shipments of coal were crowded into the two last months of the season.

It must be understood that the rates making up the following tables are not averages on quantities of freight. They are the averages of rates ruling from day to day throughout the season. It may be well to note, therefore, that as large quantities of soft coal were moved during October and November, and the early part of December, when rates were highest, the average rates paid by most coal shippers may run somewhat higher than those recorded in the tables:

AVERAGE DAILY RATES OF FREIGHT, SEASON OF 1897.

	Cents.
Iron ore, Escanaba to Ohio ports, gross ton	45 3
Iron ore, head of Lake Superior to Ohio ports, gross ton	57.2
Iron ore, Marquette to Ohio ports, gross ton	54.6
Wheat, Chicago to Buffalo, bushel	1.5
Wheat, Duluth to Buffalo, bushel	1.7
Soft coal, Ohio ports to Milwaukee, net ton	28.5
Soft coal, Ohio ports to Duluth, net ton	26.2
Soft coal, Ohio ports to Portage, net ton	27.8
Soft coal, Ohio ports to Manitowoc, net ton	30.9
Soft coal, Ohio ports to Sheboygan, net ton	23.6
Soft coal, Ohio ports to Green Bay, net ton	29.9
Soft coal, Ohio ports to Escanaba, net ton	29.5
Hard coal, Buffalo to Milwaukee, net ton	29.0
Hard coal, Buffalo to Chicago, net ton	29.0
Hard coal, Buffalo to Duluth, net ton	25.9

AVERAGE DAILY FREIGHT RATES DURING TEN YEARS ENDING WITH 1897.

Iron ore, head of Lake Superior to Ohio ports, gross ton	$1.02
Iron ore, Marquette to Ohio ports, gross ton	.90
Iron ore, Escanaba to Ohio ports, gross ton	.72½
Soft coal, Ohio ports to Milwaukee, net ton	.53
Soft coal, Ohio ports to Duluth, net ton	.43
Hard coal, Buffalo to Chicago, net ton	.53
Hard coal, Buffalo to Duluth, net ton	.35
Wheat, Chicago to Buffalo, bushel	.02

AVERAGE FREIGHT RATES ON IRON ORE PER GROSS TON, FROM PORTS NAMED TO OHIO PORTS—TABLE COVERING WILD AND CONTRACT RATES FOR TWENTY YEARS PAST.

YEAR.	ESCANABA.		MARQUETTE.		ASHLAND AND OTHER PORTS AT THE HEAD OF LAKE SUPERIOR.	
	Wild or daily rate.	Contract rate.	Wild or daily rate.	Contract rate.	Wild or daily rate.	Contract rate.
1878	$0 81	$0 90	$1 22	$1 30	.....	.....
1879	1 25	90	1 83	1 40	.....	.....
1880	1 70	1 85	2 26	2 75	.....	.....
1881	1 36	1 75	2 05	2 45	.....	.....
1882	1 04	1 40	1 26	1 75	.....	.....
1883	1 22	1 00	1 40	1 20	.....	.....
1884	87	1 10	1 08	1 35	.....	.....
1885	78	90	98	1 05	$1 25	$1 15
1886	1 28	1 05	1 51	1 20	1 78	1 20
1887	1 59	1 40	1 87	1 63	2 23	2 00
1888	1 05	90	1 30	1 15	1 43	1 25
1889	1 01	1 00	1 19	1 10	1 34	1 25
1890	89	1 10	1 07	1 25	1 17	1 35
1891	84	65	1 02	90	1 11	1 00
1892	74	1 00	98	1 15	1 15	1 25
1893	56	85	71	1 00	77	1 00
1894	46	60	60	80	78	80
1895	73	55	92	75	1 13	80
1896	52	70	66	95	77	1 05
1897	45	45	55	65	57	70

Charge to vessel in 1897 for trimming and unloading, 16½ cents a ton.

Average ore rates for the entire period of twenty years: Escanaba, contract $1.00, wild 96 cents; Marquette, contract $1.29, wild $1.22. Average for past ten years: Escanaba, contract 78 cents, wild 72½ cents; Marquette, contract 97 cents, wild 90 cents; Ashland and other ports at the head of Lake Superior, contract $1.04½, wild $1.02.

AVERAGES OF DAILY RATES ON SOFT COAL FROM OHIO PORTS TO MILWAUKEE ESCANABA, DULUTH, GREEN BAY AND MANITOWOC.

Year.	Milwaukee. Cents.	Escanaba. Cents.	Duluth. Cents.	Green Bay. Cents.	Manitowoc. Cents.
1888	84	61	66	.....	.....
1889	54	49	52	.....	.....
1890	64	45	49	.....	.....
1891	61	52	49	.....	.....
1892	58	43	43	55	49
1893	48	40	38	50	41
1894	48½	39	37½	49½	48
1895	54	39	36½	50	51
1896	33½	27	29½	32½	32
1897	28½	29½	26	30	31
Average, ten years	53	42½	43	44½	42

Chicago rate about same as Milwaukee.
Coal of all kinds shipped in net tons and handled without charge to vessel.

AVERAGE OF DAILY LAKE FREIGHT RATES ON HARD COAL FROM BUFFALO TO CHICAGO, DULUTH AND TOLEDO DURING TEN YEARS PAST.

Year.	Chicago. Cents.	Duluth. Cents.	Toledo. Cents.
1888	86	65	41
1889	52	41	27
1890	62	43	33
1891	56	29	25
1892	59	43	27
1893	49	29	28
1894	46	25	25
1895	59	24	30
1896	36	24	25
1897	29	26	..
Average for ten years	53	35	30

Rate to Milwaukee practically the same as to Chicago, and Detroit rate about the same as Toledo rate.
Hard coal is also net tons and is handled without charge to vessel.

AVERAGE RATES ON WHEAT PER BUSHEL BY LAKE FROM CHICAGO TO BUFFALO.

Year.	Cents.	Year.	Cents.	Year.	Cents.
1857	9.89	1871	7.62	1885	2.02
1858	3.76	1872	11.46	1886	3.68
1859	5.08	1873	7.62	1887	4.13
1860	9.89	1874	4.03	1888	2.56
1861	11.53	1875	3.42	1889	2.51
1862	10.49	1876	2.90	1890	1.96
1863	7.51	1877	3.72	1891	2.38
1864	9.58	1878	3.07	1892	2.19
1865	9.78	1879	4.74	1893	1.66
1866	12.34	1880	5.76	1894	1.27
1867	6.67	1881	3.44	1895	1.97
1868	7.14	1882	2.50	1896	1.70
1869	6.81	1883	3.41	1897	1.56
1870	5.88	1884	2.18	Average 41 yrs	5.16

Charges to vessels for shoveling, trimming and tallying weights of grain amounted to about $4.35 per 1,000 bushels in 1897.

RANGE OF LAKE FREIGHT RATES ON WHEAT FROM DULUTH TO BUFFALO.

Year.	Rate, cents.	Year.	Rate, cents.
1897	1¾*	....	.....
1896	2⅛*	1890	2 @5
1895	3½*	1889	2 @5
1894	1¼@3	1888	2 @5
1893	1¼@3½	1887	2 @8
1892	2¼@4	1886	3¼@8
1891	1¼@9½	1885	1½@5

* 1895, 1896 and 1897 figures represent average of daily rates for season.

Test of Screw vs. Paddle.

A "tug of war" between early steamships is described and illustrated in a series of articles on "Ship Building and Marine Engineering on the Thames in the Victorian Era," now running in the Engineer of London. The contest took place on June 20, 1849, and lasted one hour, the two vessels being tied stern to stern and the engines of both set going, with the result that the screw-propelled Niger dragged the Basilisk backward against the whole force of her engines at the rate, by log, of 1.466 knots an hour. These vessels were at the same time tried at different depths of immersion, and the conclusions arrived at from the results obtained were that, in similar vessels exerting the same amount of engine power and impelled by steam alone at their highest obtainable speed, the screw is the most advantageous propeller at deep immersions and the paddle wheel the best in the case of light and medium immersions.

Both the vessels were fitted with engines of 400 nominal horse power. The propelling engines of the Basilisk were of the ordinary oscillating type and those of the Niger were a special kind of direct acting horizontal engine, having two pairs of cylinders, one pair being placed on each side of the main crank shaft, with an air pump between. Each piston had two piston rods working in different planes, one being above and one below the crank shaft, the rods of each pair of cylinders being connected to one crosshead, from which a connecting rod passed to the crank and put its shaft in motion. The air pumps were worked by a similar arrangement to that by which the motion of the pistons was communicated to the cranks, the whole forming one of the best examples of direct-action engines that had at their time been produced.

General Re-survey of the Lakes.

Until naval officers connected with the hydrographic service undertook the publication of lake charts, a few years ago, all charts of the lakes published by the government were made under the direction of the army engineer corps. Records of the general survey of the lakes, made a number of years ago, are in charge of the army engineers, and congress provides each year a small appropriation for the correction of charts made from this survey. This appropriation is turned over to the engineers, and a small force is engaged constantly at Detroit in the correction of the so-called army charts. Since they have established branch offices on the lakes, the naval officers of the hydrographic service have prepared new charts, going over practically the entire chain of lakes. These charts have been based on British surveys of the Canadian shore, as well as the general survey made by the United States government, and the corrections have also included the results of special surveys in different localities made by the U. S. S. Michigan. In consequence of this duplication of the work of making charts, considerable rivalry has existed between the army and navy officers. Nearly all of the naval officers connected with the light-house service on the lakes of late have recommended a new general survey, most of them claiming that the old survey is of little account and that the hydrographic bureau of the navy is the only branch of the government properly equipped for such work. But the army engineers who have had to do with the publication of charts do not agree with their friends of the navy in this regard, as shown by the following letter to the Review from one of them:

"I notice in your issue of the 2d inst. that the naval people are doing exactly what was predicted, and, now that they have succeeded in establishing a large number of hydrographic offices, they propose to justify their existence by a grand stand play for a general re-survey of the lakes. There is no doubt that re-examinations are needed at many localities, and that these re-examinations should be made. This matter has been advocated by the army engineers for many years, prominent among these advocates being the late Gen. O. M. Poe. A general re-survey of the lake region, however, would be silly, as it would involve the unnecessary duplication of much work.

"What would be the best for the lake interests would be re-examinations of such localities as the modern draft of vessels requires and what is wanted is the best work for the least money. Surveying is a branch of engineering and has nothing to do with seamanship. A civil engineer can make a better and more economical survey than a sailor. If our navy friends do this work they will employ the sailors of their various vessels, and while these sailors are believed to be the best in the world, their knowledge of engineering cannot be sufficiently extensive to warrant their competition in enginering matters with our civil engineers, who are believed to be the best civil engineers in the world.

"As has already been pointed out, the proper organization to do this work is the one which has upon its files the records of the first and only general survey of the lakes, and in addition, the records of all of the river and harbor improvements ever made upon the lakes. This organization would employ neither soldiers nor sailors for the making of surveys and charts, but skilled civil engineers and draftsmen, who know more about the subject than anyone else, and who can accomplish the greatest result with the least expenditure of money, for the simple reason that every man can attend to his own business better than he can to some other fellow's.

"It is easily understood why the line officers of the navy are so keen and why they work and lobby so earnestly to secure congressional action in their favor. They do this first and foremost because they want shore duty rather than remain cooped up in a man-of-war to look after our interests abroad. A second reason is that with the extensive use of machinery on modern men-of-war the old-school line officer is continually finding himself closer and closer to the edge of the quarter-deck, and he is therefore anxious to provide a reason for his continued existence when he finally becomes crowded off the quarter-deck altogether. In this last matter he is entitled to sympathy, but it is difficult to see why he should seek to abandon his profession altogether and try to become a civil engineer. The government has plenty of vessels that form no part of the naval establishment, and the younger officers of the navy would make excellent commanders for them and would in these vessels acquire a much better training in the responsible duties of their profession than they can possibly get as subordinate officers of a man-of-war. Take the fleet of the light-house establishment, for example, which is a very extensive one. Why should not these vessels be officered by lieutenants and ensigns of the navy, who in this way would acquire a greater familiarity with our coasts and harbors than in any other? They would cease traveling on these boats as passengers, and being responsible for the safety and efficiency of the vessels, would always be wide awake to note everything in their surroundings that had any bearing on their profession. The large fleet of the government on its inland waterways would also be available in the same way. This would greatly cheapen the cost of government work, and by leaving navigation matters to navigators and engineering matters to engineers would 'render unto Cæsar the things which be Cæsar's.'"

Appealing to the Secretary of the Treasury.

Readers of the Review are familiar with a lengthy correspondence that took place recently between George L. McCurdy of Chicago and James A. Dumont of the steamboat inspection service. Mr. McCurdy, representing extensive insurance interests, directed attention to a misunderstanding that existed among lake vessel masters regarding the use of passing signals in fog, and claimed that circulars tending to mislead the vessel men in this regard were issued from the offices of local inspectors on the lakes. It was evident that a misunderstanding did exist regarding the plain provisions of the "White law," and the correspondence drifted into a general discussion of methods of the steamboat inspection service, the Chicago representatives of the underwriters claiming that circulars and other printed matter dealing with rules for lake navigation are incomplete in many instances and are usually encumbered with a lot of matter pertaining to laws for the coast and rivers. The insurance agents secured no satisfaction from the chief of the steamboat inspection service, and they accordingly decided to take the matter up with the secretary of the treasury, which they did last week.

Before going to Washington, Mr. W. H. Prime of the Prime-McCurdy syndicate, undertook, with Attorney John C. Shaw of Detroit, to secure the endorsement of vessel owners in all parts of the lakes to a series of resolutions bearing upon the correspondence referred to above. Signatures of practically all of the vessel owners of Cleveland, Detroit and Buffalo were attached to the following resolutions:

"To the Honorable Lyman J. Gage, Secretary of the United States Treasury:—The undersigned vessel owners, believing that there exists a necessity for immediate action for the prevention of collisions on the great lakes, and their connecting and tributary waters, most respectfully request that your department will take such action as shall insure:

"First—That any and all rules which may be inapplicable or in any way in conflict with the statutory rules and regulations for prevention of collisions on such waters may be withdrawn from circulation thereon.

"Second—That the supervising and local inspectors of the steamship inspection department in the various districts for the great lakes shall be familiar with all of the laws governing on such waters.

"Third—That the rules and regulations for the prevention of collisions be brought to the attention of, and be fully understood by all officers of steam vessels licensed by the government."

Our Washington correspondent tells of a meeting with the secretary of the treasury. He says: "Messrs. Prime and Shaw were joined here by Mr. Charles Counselman, well-known grain shipper of Chicago, and these gentlemen were given a personal hearing by the secretary of the treasury on Friday morning, the 10th. Gen. Dumont was called in later and the subjects heretofore covered by Mr. McCurdy's correspondence were fully discussed. Numerous cases of the distribution of conflicting rules on the lakes were given particular attention. The advisability of having the supervising and local inspectors examined as to their knowledge of all the rules and regulations for the prevention of collisions was also discussed. The secretary requested the gentlemen to prepare recommendations of just what they would like to have the board of supervising inspectors adopt, and forward the same to him with a brief thereon, and Gen. Dumont requested that they appear before the next meeting of the board and present their requests, and assured them that he would co-operate with them and do all in his power to remedy any existing fault that might be pointed out.

"Mr. Prime, when seen in regard to this matter, gave out the above information, and stated that he did so because he felt that the subject was of so great importance that he did not feel that they should proceed further or that the board of supervisors should take definite action until there had been an opportunity for the vessel owners generally and others interested to be heard. He says that their attorney will take the matter up for them before the board at its meeting on the third Monday in January, and he asks that any one having suggestions to offer will kindly communicate with them so that the same may be considered before definite requests are presented to the secretary of the treasury, preliminary to the hearing before the board of supervising inspectors."

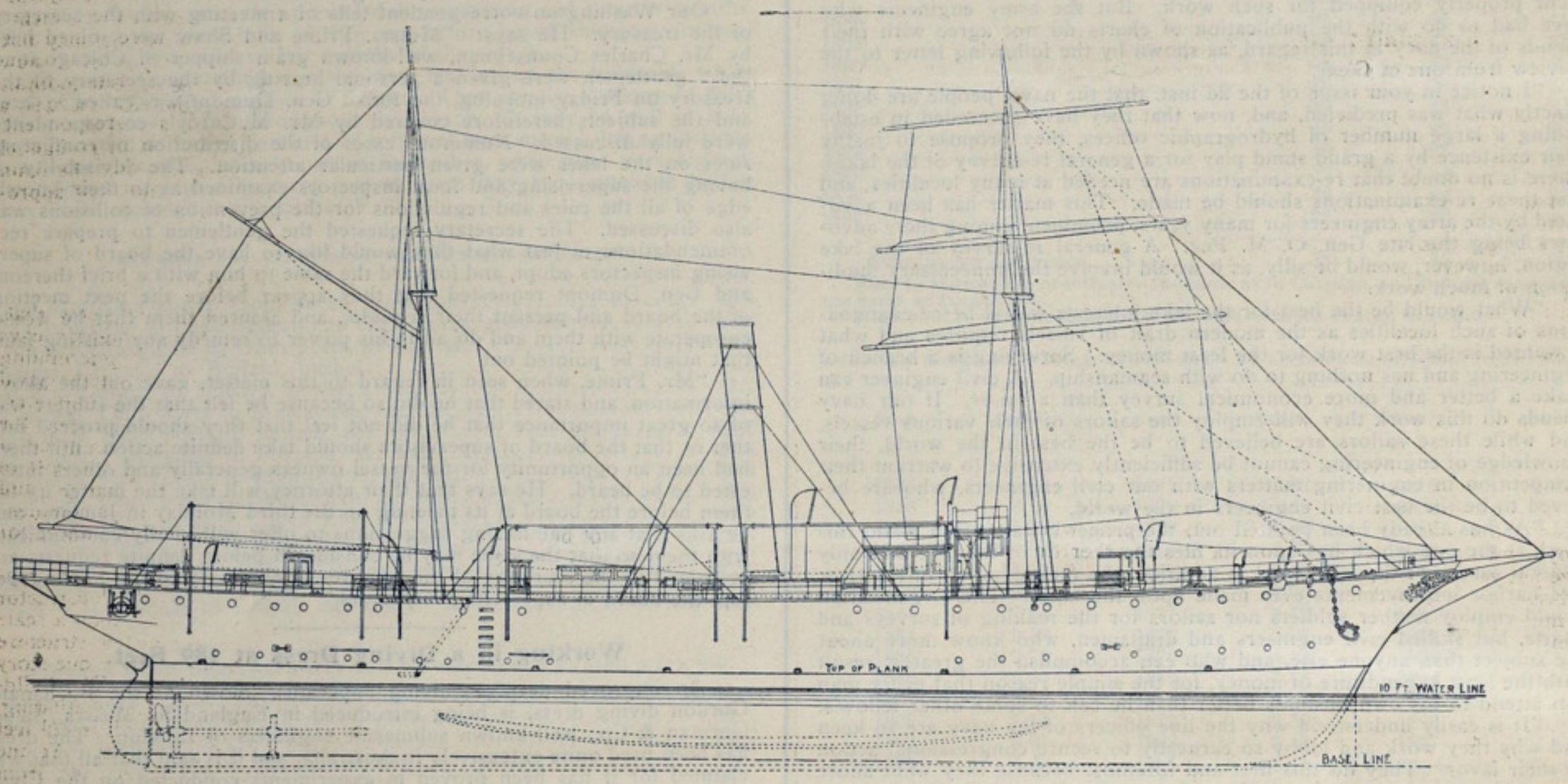
Working in a Diving Dress at 189 Feet.

An improved deep-sea diving apparatus, known as the Buchanan-Gordon diving dress, is being introduced in England by Messrs. Siebe, Gorman & Co., well-known submarine engineers of London. The dress has been used quite extensively in Australia, and it is said that all that was claimed for it has been proven in experiments conducted on the Clyde recently by W. R. Walker, chief diver for the London firm. These experiments are described by the London correspondent of the Scientific American. After accustoming himself to the new dress and familiarizing himself with the currents, etc., the English diver bottomed 31 fathoms, or 189 feet. He was under the water for fifty minutes, during which he was subjected to a pressure of over 80 pounds to the square inch, but on coming up he was quite fresh. On regaining the boat and divesting himself of the dress he showed not the slightest signs of exhaustion, and on all hands the experiment was voted a great success. This depth has never before been attained in Great Britain. The English diver had never been deeper down than 133 feet or 22 fathoms. While on the ground he said he moved about with as much ease and comfort as he had found at a depth of 15 fathoms in the old dress. During the experiments the pumps, air hose, and a telephone were used. The diver was delighted with the telephone, through which, while he was below, he spoke to his attendant on the deck of the vessel.

The dress has been designed to meet the requirements of all descriptions of deep sea diving up to 30 fathoms, or at even greater depths. It is a dress which in itself withstands the tremendous pressure of great depths, enabling the diver to breathe a normal air pressure. In effect it is a suit of armor which defies all assaults, yet enables the wearer to move about with the utmost ease. The most important part is the helmet, which descends to the waist in one piece of solid copper, and weighs no less than 250 pounds, while the dress weighs 500 pounds. The arms and the lower half of the dress consist of a series of spiral springs covered with waterproof material, which at the same time gives strength and mobility. These springs are made of Delta metal—a phosphor bronze of immense strength. By a series of ingenious arrangements the suit can be adjusted to the height of the diver, and there is a jointed brass support running along the outside of the legs, which is intended to prevent the horrible accidents which might be caused by the upward pressure of the water. But perhaps the most interesting portion of the Gordon dress is the escape valve. Presuming a diver to be at a depth of 26 fathoms, he would have to stand a pressure of 69 pounds to the square inch; and, therefore, an air pressure of more than this amount would have to be pumped into the diver's dress in order that the escaping air might overcome the external resistance. But in the Gordon process this difficulty is overcome in a very simple manner. The escape valve, which is perfectly under the diver's control, is attached to a floating hose, the upper end of which can be submerged at any required depth below the surface. This reduces the head against which the air escapes and thereby permits the pressure of air supplied to the diver to be proportionately diminished. But perhaps the most valuable feature of the invention is the capacity of the dress for retaining air.

The New Steamer "Klondike."

A side elevation plan of the new steamer for the United States Coast and Geodetic Survey, treasury department, is reproduced on this page. The limit of the appropriation for the building of this vessel, which is for service in Alaska, is $125,000. Bids will be opened Jan. 11, 1898. Plans and specifications with forms of proposal may now be had upon application to the United States Coast and Geodetic Survey, Washington, D. C. Principal dimensions of the vessel are as follows: Length over all, 196 feet 3 inches; length between perpendiculars, 165 feet; breadth, moulded (to outside of steel frames), 30 feet 8 inches; breadth, extreme (to outside of wood planking), 31 feet 6 inches; depth of hold, from top of flat keelson plate to top of main deck beams amidships, 19 feet 5 inches; displacement to mean draft of 11 feet 6 inches above bottom of wood keel amidships, 805 tons. Engines will be rights and lefts, placed in a common water-tight compartment, and will be of the vertical inverted cylinder, direct-acting, triple expansion type, each with a high pressure cylinder 12 inches, intermediate 18 inches, and low pressure 27 inches in diameter, the stroke of all pistons being 27 inches. The collective indicated horse power of propelling engines will be 850 when making about 150 revolutions per minute, with a steam pressure of 160 pounds in the boilers. The high pressure cylinder of each engine will be forward and the low pressure cylinder aft. Main valves will be of the piston type for the high pressure cylinders, and the intermediate and low pressure cylinders will have slide valves, all worked by Stephenson link motions with double bar links. There will be two horizontal return-fire tubular boilers, each with two corrugated furnaces. The mean outside diameter will be 11 feet 1 inch and the length about 11 feet. The total grate surface will be about 90 square feet and the total heating surface about 2,833 square feet.



NEW COAST AND GEODETIC SURVEY STEAMER FOR SERVICE IN ALASKA.

Buffalo newspapers are showing up some enormous increases over contract prices in the work of improving the Erie canal, and it is now claimed in some quarters that the cost of the canal improvement will probably aggregate $18,000,000, instead of $9,000,000, as originally planned. Hints of political jobbery are freely made in some of the state papers. On contracts covering only ten sections (there are sixty such contracts let) the amount paid for advertising is $22,379.48, and for inspection $27,710.93, although the estimate on the entire work (about 40 miles of the canal) was only $1,517,703.65. "An analysis of the total figures for these ten unfinished contracts," says a dispatch from Albany, "shows that they have already cost the state 38.65 per cent. more than the contract figures and 16.13 per cent. more than the final estimates, while they run 28.24 per cent. over the original estimates. On these ten contracts, the payments to inspectors amount to as much as 1.57 per cent. of the payments to the contractors, while the cost of advertising for bids is equal to 1.26 per cent. of the amounts which the contractors have earned."

The Bessemer Steamship Co. received a telegram, Thursday, announcing the death of Capt. Wilbur Holdridge at Black Rock, N. Y. He sailed the barge Alfred Krupp. On the last trip this season he caught a severe cold that resulted in death. Capt. Holdridge was known as one of the most successful men on the lakes in handling large steel barges. He had the distinction of sailing the first whaleback barge ever built, the 101. He took the 101 when it was freely prophesied that she would go under in the first big storm. He was well thought of by his employers.

Travel the road whose service is great,
The one that offers a holiday rate,
Where trains are fast and "up-to-date;"
You know, of course, the Nickel Plate. 404—Dec. 31

Suggestions from the Captains.

In a letter from Ogdensburg to Geo. L. McCurdy of Chicago, Capt. Duncan Stalker of the steamer Pueblo says: "I noticed on our way down that East Charity shoal, foot of Lake Ontario, has another victim, the steamer Rosedale, and will likely claim more in another year if the place is not properly marked. Last winter the Lake Carriers' Association, through Capt. Geo. P. McKay, asked the Ship Masters' Association to suggest places for the location of gas buoys that were to be assigned to the lakes. Suggestions were made in writing, and East Charity shoal was marked as a very dangerous place, and one that should have a gas buoy. But the gas buoy was placed on Charity shoal, 1½ miles further away from the channel now used by all deep draft boats."

Capt. Stalker is correct in what he says about the suggestions of the ship masters and the advantages that would be derived from a buoy on East Charity shoal, but he did not understand that the buoy now on Charity shoal was secured by local interests on Lake Ontario before the ship masters recommended a buoy for the shoal to which he refers. The following note from Commander Jewell, light-house inspector of the tenth district, would indicate, however, that East Charity shoal will probably be marked by a buoy next season. Commander Jewell says: "In reply to your communication regarding the present location of the gas buoy on Charity shoal, Lake Ontario, and the proper marking of the shoal to the southward and eastward of Charity shoal, I beg to say that the gas buoy was placed on Charity shoal in accordance with an act of congress, and that the East Charity shoal is one of the places for which a gas buoy has been recommended, and, probably, will be authorized for the next season of navigation."

Capt. James Parsons of the steamer Charles Hebard writes of buoys in Niagara river: "I would suggest placing another black buoy," he says, "below those now on the ranges at the head of the river, as there is an eddy in this vicinity and we find that we often pick up the ranges too soon in coming up the river. I would also place two more red buoys at the head of strawberry island and a red buoy also off the upper ice reach at the head of Tonawanda island."

Baltic-Black Sea Canal.

The London Times gives a very interesting account of the canal, 1,080 miles long, between the Baltic and the Black Sea, which is to be begun next spring, as the surveys are nearly finished. The new waterway is to be 217 feet wide at the top, and 117 feet at the bottom, with a depth of 28½ feet, which will enable the largest war vessels to pass through. The canal begins at Riga, and follows the course of the river Duna as far as Dunaburg. Here the great excavations will begin which will cross the watershed and connect the canal with Lepel on the Beresina. That river will be utilized as far as its junction with the Dnieper, when the latter will be followed to its mouth. Of the total length of the canal 875 miles will be in canalized rivers, leaving only 125 miles to be dug. The canal is to be so strongly built that it will allow vessels to steam 6 knots an hour. At that speed, seeing that the canal is to be lighted throughout with electricity, the whole journey will only take 144 hours, or say a week. The cost is put at $100,000,000, and the time four years, both of which estimates are sure to be exceeded. The enterprise is a very great one, and if carried out may have important political results. It was the completion of the Baltic and North Sea canal that made Russia agree to the French alliance.

A Washington dispatch says that the river and harbor committee of the house of representatives has decided to hold no session until after the holidays. This is a further indication of the disposition to hold appropriations down to low figures.

The Question of Regulating Lake Freights.

There was quite a large attendance at the meeting in Cleveland Wednesday of members of the Lake Carriers' Association, who are considering the question of changing the by-laws of the association so as to admit of the adoption of a scheme for regulating freight rates in certain lines. President James Millen and Secretary C. H. Keep were present, as well as nearly all of the leading Cleveland owners who are not associated with the ore companies. Messrs. A. A. Parker and John Pridgeon came from Detroit with President Millen. A lengthy discussion of the subject resulted in the appointment of a committee, representing different ports around the lakes. It was agreed that if a plan involving the maintenance of fixed reasonable rates of freight throughout the season could be arranged the shipping concerns would take an interest in the scheme, on account of the advantages to be derived from assurance of stabilty in rates. This general committee is expected to take the matter up with shippers and be prepared to report at the annual meeting of the association in Detroit, which, according to action of the executive committee, will be held beginning January 19. Members of the committee that will have the lake freight subject in hand are: A. A. Parker, Detroit; M. A. Bradley, H. A. Hawgood, B. L. Pennington, H. D. Goulder and Capt. J. W. Moore, Cleveland; W. H. Wolf, Milwaukee; C. W. Elphicke, Chicago; W. S. Brainard, Toledo; C. A. Eddy, Bay City, and A. B. Wolvin, Duluth.

Complaint About Early Removal of Buoys.

In a letter from Gladstone, Mich., date of Dec. 10, to Geo. L. McCurdy of Chicago, Capt. Wm. Jamieson of the steamer Minneapolis says:

"I think you are about the only friend the vessel masters have on the lakes, so you will please excuse me for making this complaint to you. The light-ships and gas buoys, of which so much is expected as aids to navigation, are like the story of the Dutchman's anchor—'At home when wanted.' If there is any need for them in summer, we surely need them more now when we have only nine hours of daylight in the twenty-four. The two gas buoys in Poverty passage were taken out about two weeks ago. I have made two trips to Buffalo but have seen none, and the light-ship on Eleven-Foot shoal, eight miles south of Escanaba, is taken in, and I saw by a notice in one of the papers that the light-ships on Lakes Huron and Michigan would be taken in the 10th of this month. Now, there are seven large steamships here, and four of them of steel, and the Centurion and others coming in, all loaded and going to load flour and grain here for Buffalo, which will take all of eight days yet to finish. Then we have to grope our way to Buffalo with millions of dollars under our feet the best way we can. Masters wonder where that fine ship Gresham is, which is to protect our lake marine. I would state for myself and the masters who are now sailing that we would thank the 'powers that be' to put out no gas buoys or light-ships again unless they keep them out while hundreds of boats are still sailing. This is the time when we need these gas buoys and light-ships, more so than at any other time of the season. I have not yet seen ice enough between Buffalo and Squaw point at this port to break an egg shell, and that such a state of affairs should exist where so much property is at stake appears unjust to the vessel captains whose safety and bread and butter depend upon channels properly lighted and buoyed."

From the Head of the Lakes.

West Superior, Wis., Dec. 15.—It is expected that the new machine shop at the works of the American Steel Barge Co. will be completed about Jan. 1. The shop is now roofed, and a Westinghouse generator of 150 K. W., as well as an engine and several motors are on the ground. Work is now well under way on both the steamer and tow barge that are to be built during the winter, and up to the close of navigation there was a vessel or two getting repairs every day. Repair work during the winter will also be quite heavy, as a number of ships of the Minnesota company's fleet, as well as those owned by the barge company and laid up in this vicinity will require overhauling. There are also two or three extensive special jobs. The Magna, which was here on a late trip, struck at the "Dyke" Nov. 26 and has four bad bilge plates and nine broken frames and futtocks. She will be repaired during the winter. The Constitution furnishes the last dry dock job of the season at this point. It is annoying to everybody interested in this vessel to find that she was very unfortunate during the season. On her second trip down the lakes she sustained bottom damages, and on her third trip a jam at the Sault resulted in damages to side frames and plates. Then on her last trip up the lakes she fetched up at the Lime-Kilns and at the "Dyke," so that final necessary repairs were made quite extensive. With a vessel like the Constitution these accidents seem especially unfortunate. Judges of a good steel barge say that the fairness of her stringers and deck plating is always noticeable, as compared with a number of other steel barges that might be named, and this is what tells in the big barges, as many of them when loaded show bulges and dents in the stringers and deck plating.

The wonderful movement of soft coal that was crowded into the closing days of the season made a great difference in stocks on the docks of Duluth and Superior. A few weeks ago they were almost bare, but with heavy deliveries in the latter part of November they assumed immense proportions and were much like the great piles of ore that loom up on Lake Erie docks in the fall.

Proposed Improvement of New York Harbor.

New York, Dec. 15.—One of the largest projects to be presented to the river and harbor committee of the present congress is the proposed improvement of New York harbor, in accordance with surveys and estimates authorized in the last river and harbor act for a 35-foot channel from the Narrows to the sea. Philadelphia and other places will undoubtedly seek big appropriations from congress on account of this movement in New York, but the heads of the large transatlantic steamship lines and business men generally will not relax their efforts on account of the plans of other cities or the determination of some members of congress to reduce river and harbor appropriations.

The present main ship channel is 1,000 feet wide and carries 30 feet at mean low water, and as there are now seven transatlantic steamers which draw between 29 and 30 feet of water, two that draw from 30 to 31 feet, and one that draws 32 feet, plying between this and foreign ports, besides which there are several vessels being built which will have a draft of from 30 feet to 32 feet, the necessity of a deeper channel is apparent. As a result of the surveys authorized last year, the engineer's report states that the net cost of dredging a channel 35 feet deep and 1,000 feet wide from the Narrows to the sea would be $1,740,000. The report also estimates that a channel of the same depth and 1,500 feet wide would cost $2,772,000 net, while the cost of a 35-foot channel 2,000 feet wide would be $4,180,000. These estimates respectively include the cost of building the four, five and six additional dredges, at $100,000 each, which would be needed to do the work. If the work should be done by contract these figures should be increased about 20 per cent. to include contractor's profits and interest on investment.

Considering the moderate cost for which this improvement could be made, remembering that during the last fiscal year over 37 per cent. of the total exports and 63 per cent. of the total imports of the United States passed through the port of New York, shipping men believe that a united effort should be made by the commercial organizations of the port to secure the passage of an appropriation in the next river and harbor bill sufficient to carry out the work. Moreover, it is believed that the matter of making a deeper channel should be got under way as soon as possible, in order that other necessary improvements which are now under consideration by the light-house board, and the carrying out of which to a measure depends upon any changes that may be made in the harbor, may not be postponed longer than necessary. A re-survey of the harbor is now being made which it is expected will be finished in three or four months. When it is completed, the practicability of deepening the east channel, a shorter and more direct route to the ocean than the main ship channel, will be considered. While the marine interests first seek a 35-foot channel they would also prefer a less complicated and shorter route than the main channel affords, and it will be their endeavor to have a sufficient appropriation made to accomplish one or both of these ends.

General Use of the Model Tank.

It will interest ship builders throughout the country to know that, although the model tank now under construction at the Washington navy yard is intended primarily for the work of investigating and determining the most suitable shapes and forms to be adopted for United States naval vessels, this tank will be open to ship builders throughout the country. The act providing for the construction of this tank states that "upon the authorization of the secretary of the navy experiments may be made at this establishment for private ship builders, who shall defray the cost of material and of labor of per diem employees for such experiments; and that the results of such private experiments shall be regarded as confidential and shall not be divulged without the consent of the ship builder for whom they may be made."

The Washington tank, on which work is now progressing very rapidly, may be said to be the result of persistent efforts of Chief Constructor Hichborn, and, following out his direction, the plant will be upon a scale considerably in advance of anything abroad. The completed structure will consist primarily of a concrete-lined basin surrounded by a one-story brick building, which is surmounted by a steel-trussed roof. The building is 500 feet long and 50 feet wide, with extensions for the ventilating, heating, pumping, filtering and power plants. The main basin is 370 feet long and 43 feet wide, and will have a uniform depth of 14 feet. At one end will be a narrow, shoal extension, 70 feet long and 6 feet wide, from which the trial runs will be started, and at the other end, one 34 feet long and 8 feet wide, into which the models will be carried upon the completion of the runs. The latter extension will have no special features; but at the starting end there will be a pit on each side and at the rear for the purpose of providing convenient means for measuring the models as they float in the basin preparatory to the trials.

The tracks on which the carriage will travel are to be of the heaviest railroad type, made as rigid as possible. The towing carriage is driven by four electric motors run on the trolley system. Two will be needed for runs at speeds from 1 to 12 knots, while all four will be required at 20 knots. It may be stated here that a 20-knot run on the part of a model is the correlative of a speed of perhaps 40 knots or more in the contemplated craft.

The high speed at which it may be needful to run the carriage—20 knots, or 23 miles an hour—necessitates some special and reliable arrangement at the end of the run for bringing the carriage to a halt without undue shock to the heavy mass in motion. This is to be accomplished by a huge friction brake carefully graduated in its pressure by hydraulic cylinders, and operating uniformly on each side of the carriage. When this brake is in operation it will be possible to bring the carriage to a stop from full speed within 20 feet. A supplementary or emergency brake, in the shape of an immense hydraulic cylinder, is automatically thrown into gear upon the failure of the friction brakes and will be absolute in case of accident. In order to lessen the chance of disturbing draughts, the walls of the building will be without windows, light and air coming in through a glazed skylight. The steel-trussed roof is both unique and light, and does away entirely with any obstructing supports against the walls of the building, and leaves an unbroken run for a gallery on each side where the models may be conveniently stored after trial, and space also for a footpath from which photographs of the models under way may be taken and other observations made. The entire structure inside will be painted white, and besides providing a light and convenient building for the work in hand, will present an attractive appearance.

The Buffalo grain shoveling contract will again be a subject of contention at the annual meeting of the Lake Carriers' Association in Detroit next month. Propositions from labor unions will not be considered, as there would be no responsible parties to deal with in the unions, but vessel owners who were opposed to giving the work to Contractor Kennedy a year ago on the claim that profit in the business was very great are again lending support to a movement to have a responsible contractor in Buffalo put in a bid at a figure considerably lower than that of a year ago.

MARINE REVIEW

DEVOTED TO LAKE MARINE AND KINDRED INTERESTS.

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The books of the United States treasury department on June 30, 1896, contained the names of 3,333 vessels, of 1,324,067.58 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons, and over that amount, on the lakes on June 30, 1896, was 383 and their aggregate gross tonnage 711,034.28; the number of vessels of this class owned in all other parts of the country on the same date was 315 and their tonnage 685,204.55, so that more than half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1896, was as follows:

	Number.	Gross Tonnage.
Steam vessels	1,792	924,630.51
Sailing vessels and barges	1,125	354,327.60
Canal boats	416	45,109.47
Total	3,333	1,324,067.58

The gross registered tonnage of the vessels built on the lakes during the past six years, according to the reports of the United States commissioner of navigation, is as follows:

Year ending June 30.	1891	204	111,856 45
" " "	1892	169	45,968.98
" " "	1893	175	99,271.24
" " "	1894	106	41,984.61
" " "	1895	93	36,352.70
" " "	1896	117	108,782.38
Total		864	444.216.36

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC. *(From Official Reports of Canal Officers.)*

	St. Mary's Falls Canals.			Suez Canal.		
	1896*	1895*	1894	1896	1895	1894
Number of vessel passages	18,615	17,956	14,491	3,409	3,434	3,352
Tonnage, net registered	17,249,418	16,806,781	13,110,366	8,560,284	8,448,383	8,039,175
Days of navigation	232	231	234	365	365	365

***1895 and 1896 figures include traffic of Canadian canal at Sault Ste. Marie.**

In accordance with the policy outlined in the annual report of the secretary of the navy, Senator Hale of Maine has introduced a bill providing for the building of dry docks at Portsmouth, N. H., ($1,000,000); Boston, Mass., ($1,350,000); Algiers, La., ($500,000), and Mare Island, Cal., ($500,000) and for enlarging the docks at Brooklyn, N. Y., ($286,556); League Island, Pa., ($286,556), and Norfolk, Va., ($160,000), and for building a wharf alongside the timber dry dock at Port Royal, S. C., ($75,000). The bill also provides for the addition of a first-class sea-going coast-line battleship, at a cost of not to exceed $3,750,000; six sea-going torpedo boats of 175 tons displacement, at a cost of $1,125,000, and three torpedo boats of greater speed, to cost $900,000. It is provided that the battleship shall be primarily for coast defense and that it shall carry the heaviest armor and most powerful ordnance and have a displacement of 11,500 tons.

Since the Marsden Cellulose Co. of Philadelphia undertook the establishment of factories in different parts of the country for the removal of pith from cornstalks, ostensibly for use in war vessels, it has been found that the naval market will be but a small part of the business ultimately. It is claimed that corn pith properly prepared makes an ideal packing for journals. It is said to be 27 percent. more effective than the best known covering for steam boilers, steam pipes or refrigerators. It makes a better paper than wood pulp. It can be used as a basis for smokeless powder. It makes photograph films. It is a substitute for the materials entering into the manufacture of papier mache and composition. It is fire-proof. It makes excellent linoleum, water-proof cloth, imitation silk and the finish on patent leather. The pith can be used in a hundred different directions.

The action of Manager L. M. Bowers of the Bessemer Steamship Co. in putting into winter quarters the entire Rockefeller fleet after their engagements in the ore trade were at an end has been the subject of considerable gossip. Rates of 4 and 5 cents on wheat from Duluth and Fort William to Buffalo were very tempting in the closing days of the season, and the figures offered on coal were also profitable, but there was, of course, the disadvantage of vessels being scattered to all parts of the lakes, if turned into the grain and coal trades late in the fall. No explanation of the action of the Bessemer management in quitting so early is given out, but vessel owners who are talking of the matter probably have reason to shake hands with themselves. If this big fleet had been turned into the grain trade the result would probably have been a marked reduction in freights.

An effort will probably be made in the present congress to have the government lend assistance to a New York dry dock scheme. The International Dry Dock & Construction Co. of New York proposes to build and maintain a steel floating dry dock of the pattern recommended by the naval board, 550 feet long, of over fifteen thousand tons capacity, costing, they estimate, $1,500,000, and to complete the same ready for service in nine months, if insured by the government 6 per cent. interest on the amount invested for twenty years. For this remuneration they propose, in addition, to allow the use of the dock for one hundred days each year and at their own expense to dock vessels of the government within that time.

At the present rate of increase, the tonnage of steam vessels of all kinds owned on the lakes will within two years be greater than the tonnage of steam vessels owned on the Atlantic and Gulf coasts. At present there are on the lakes more vessels of the largest type (those of 1,000 tons and over 1,000 tons) than are to be found in all other parts of the country, but a great number of small steam vessels owned on the Atlantic coast brings up the aggregate tonnage. The difference between the lakes and the Atlantic coast in total tonnage of steam vessels on June 30 last was, however, only 34,000 tons in favor of the coast. This margin will soon be wiped out by the building of big steel cargo carriers in lake ship yards.

Most desirable from every standpoint of national interest and patriotism is the effort to extend our foreign commerce. To this end our merchant marine should be improved and enlarged. We should do our full share of the carrying trade of the world. We do not do it now. We should be the laggard no longer. The inferiority of our merchant marine is justly humiliating to the national pride. The government by every proper constitutional means should aid in making our ships familiar visitors at every commercial port of the world, thus opening up new and valuable markets to the surplus products of the farm and the factory.—President McKinley's message.

Postmaster Dickerson of Detroit will probably find the vessel interests entirely opposed to his plan of changing the Detroit river mail service from Detroit to the St. Clair cut. It would seem that if the summer residents at St. Clair Flats are in need of improved mail service, their requirements should be met in some way other than by a change in the marine mail service. The change to the St. Clair cut would probably facilitate the boarding of vessels, but the loss in time due to sending the mail up to the canal would be a great disadvantage. Prompt delivery of telegrams as well as letters is the most important feature of the Detroit river mail service.

In a note accompanying a business communication to the Review, Mr. O. A. Howland of Toronto, one of the members of the International Deep Waterways Commission, says: "Although the work of the commission has been closed for the present, and an unfavorable disposition has apparently developed in the United States towards the scheme of deep waterways, I still have faith that the new United States commission will produce an effective answer to the objections raised in the very able report of the United States army engineer corps, and that the subject will not lose its place in the public mind."

The navy department has received information to the effect that a contract has been placed with an English firm for three new torpedo boats for the Russian navy that will be easily the fastest war craft in the world. Their minimum speed capacity is placed at 38 knots. As this speed will demand greater power than can be supplied by the ordinary type of torpedo boat engines, the vessels are to be driven by steam turbines, having four separate shafts for three propellers on each shaft.

The Merchants' Exchange of Buffalo has forwarded to Capt. F. D. Root, in care of Pickands, Mather & Co. of Cleveland, a beautiful engrossed copy of the resolutions adopted by the exchange immediately after Capt. Root had distinguished himself by saving the lives of two survivors of the wreck of the Idaho on Lake Erie, Nov. 6. The resolutions are handsomely framed.

There was elevated and received in store from vessels at Buffalo, Monday, 2,439,000 bushels of grain. Rail shipments out of Buffalo from the elevators on the same day aggregated 958,000 bushels. This is certainly a great record for a single day in the middle of December.

Years of experience have prompted an iron manufacturer to remark that it is a peculiar characteristic of the iron and steel business that as soon as orders fall off the manufacturer or merchant acts as if the world had suddenly decided to quit using iron.—Iron Age.

The navy department has finally accepted the new gunboat Vicksburg, built at the Bath Iron Works, Bath, Maine.

Stock of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store in regular elevators at the principal points of accumulation on the lakes, Dec. 11, 1897:

	Wheat, bushels.	Corn, bushels.
Chicago	6,338,000	17,467,000
Duluth	1,242,000	1,135,000
Milwaukee	149,000	62,000
Detroit	218,000	58,000
Toledo	214,000	791,000
Buffalo	2,512,000	2,450,000
	10,673,000	21,963,000

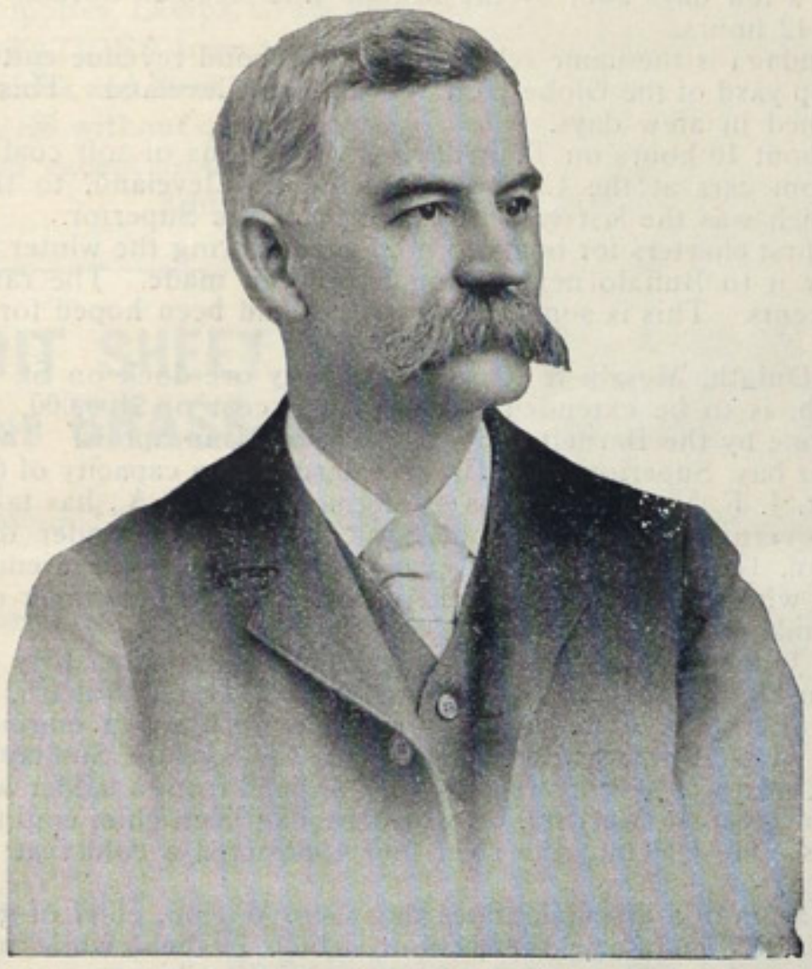
As compared with a week ago, the above figures show, at the several points named, a decrease of 141,000 bushels of wheat and an increase of 674,000 bushels of corn. On the same date there was afloat on the lakes 2,470,000 bushels of wheat, 1,569,000 bushels of corn and 1,395,000 bushels of oats. Grain afloat on the canals aggregated 46,000 bushels of oats.

The Dry Dock Engine Works of Detroit still announces each week a contract for Howden hot draft. The latest order is from the Western Transit Co. of Buffalo, and the vessel is the new package freighter for that company, the contract for which, after considerable close figuring, was finally awarded to the Detroit Dry Dock Co. The new steamer will be about 400 feet over all, and will be the best package freighter on the lakes. She will have quadruple expansion engines, and with Scotch boilers and the Howden draft she is expected to steam 13 miles an hour loaded.

An up-to-date lithograph map of the Alaskan gold fields, printed in six colors, complete and accurate. If interested, send five 2-cent stamps to advertising department, Nickel Plate Co., Cleveland. Dec. 31, 393.

An Outward Thrust Propeller.

There's a screw loose in the design of screw propellers. This is readily proven by the fact that every knot of additional speed requires so much additional power that the holds of modern war-ships and transatlantic liners are filled with boilers and engines. There is an enormous leak somewhere between the tip of the propeller blades and the thrust block.



MR. A. W. CASE.

The remedy has been sought by all forms of propeller blades, and by placing them in all positions, except one. No engineer would stake his reputation on a wheel with an outward thrust, as it seemed exactly opposite to the whole theory of screw propulsion. At least no one but a Connecticut Yankee would. He not only designed and patented a wheel with an outward thrust, but he seems to have been so impressed with the idea that he has thrust his invention before owners and manufacturers until some forty or fifty steamers, of 15 to 1500 tons, 25 to 250 feet long, and showing speed ranging from 8 to 29 miles an hour, have been equipped. In every trial the Case outward thrust wheel has given more speed with less revolutions than any other make. Vibration, which is such a factor in the wear and tear of launches and yachts, is also reduced and in most cases disappears when a Case wheel is used. This wheel increased the speed of the steam launch Dorothea 3½ miles an hour. Of course, less engine speed saves steam, and saving steam saves fuel. The best results seemed to have been obtained in the largest steamer equipped, the Middletown. She is 253 feet long, 38½ feet beam and 9 feet draft. She has twin screws, the engines being 20 and 40 by 28 inches, compound. As soon as the wheels were tried the company sent a check and ordered a duplicate set for the Hartford. The superintendent of the line says that these wheels make a saving of from one and a half to two hours in the run from Hartford to New York. Mark Hopkins had an outward thrust wheel placed on the lake yacht Bonita and it increased the speed 5¼ per cent., or a mile an hour. Booth's Lake Superior Line steamer Hunter and the Playfair Barge Line steamer H. Andrew have Case wheels. Mr. Playfair writes of their satisfaction and their intention to have other steamers and tugs similarly fitted. The Hyde Windlass Works, Bath, Me., and the Bertram Engine Works, Toronto, Ont., have furnished wheels of this kind to a number of their customers, and they endorse them because of the general satisfaction they have given. A. W. Case, Highland Park, Conn., is the inventor. An illustration of this wheel may be seen on page 6 of this issue.

Buffalo's Big Breakwater.

When the breakwater project now under way at Buffalo is completed that city will have by all odds the longest breakwater in the world. There is now 7,600 feet of breakwater at Buffalo built under an old project, and the new structure now being built will be 12,500 feet long, making a total length from the harbor entrance to Stony point of 20,100 feet, very nearly four miles. This breakwater will give Buffalo an outer harbor about four miles long and half a mile wide, permitting the utilization of the city's entire lake front. There is no breakwater, either built or in contemplation, which is as long even as the new portion of the Buffalo breakwater now under construction. The nearest approach to it is the celebrated breakwater at Cherbourg, France, which is about 12,200 feet in length and cost $10,000,000, and was about seventy years in building.

Besides being the longest in the world, the Buffalo structure will surpass all other breakwaters in one other respect, and differ in some of its important details from any breakwater ever built. For 7,500 feet at its southerly end the new breakwater is to be a timber crib structure, similar in general construction and appearance to the old breakwater in front of the city. But a breakwater, exposed as it is, demands a good foundation, and the entire lake bottom along its location is soft mud. The line of the breakwater crosses almost at right angles an old prehistoric river some two miles wide, which ran from east to west, the rock bottom of which was plainly disclosed and outlined by the soundings, and which has become filled by alluvial and lacustrine deposits to an average depth of 60 feet. To get a good foundation a part of this great thickness of mud must be removed and replaced with good material for foundations. This requires the excavation of a gigantic trench 50 feet wide on the bottom and 30 to 50 feet deep through the mud to the bottom of the lake where the water is 30 feet deep. As each section of the trench is completed it will be back-filled with gravel dredged from the Niagara river or some other place in the vicinity, which will be brought up to the level of the lake bottom. This gravel, confined in the trench, will, it is believed, afford secure foundation for the breakwater.

It is in respect to its great depth of foundation that the Buffalo breakwater differs from and surpasses all other breakwaters. Five thousand feet in length between the existing old breakwater and the timber crib breakwater is to be what is called briefly a rubble mound breakwater. It is a great heap of stone dumped on the natural bottom of the lake and brought up to a height of 12 feet above mean lake level. There are many rubble mound breakwaters and modifications thereof scattered over the world, but this one is the first to be built on the great lakes. About one-half of the bulk of the breakwater will be quarried stone and one-half gravel dredged from the Niagara river. The gravel is used in order to reduce the cost of construction; the stone costs in place from $1 to $1.50 per cubic yard, while the gravel costs but 13 cents per cubic yard. No other breakwater has ever been built, as far as known, using gravel as a hearting and foundation, and also in respect to this use of a finely divided cheap material for about half the mass the new breakwater differs from all others. It is quite a radical departure from all previous practices. The outer harbor when completed will be about four miles long and 3,000 feet wide. About 1,200 to 1,500 feet of this adjacent to the breakwater will be kept free from obstruction for the general use of shipping in passing, mooring, anchoring, etc. The other 1,500 feet or more adjacent to the shore will be available for wharves, piers, clips, coal trestles, etc.

In concluding an address descriptive of this breakwater to Buffalo business men, Major Symons, United States engineer, says: "It is difficult to imagine a place or a situation where business can be done between lake vessels and rail and canal lines to greater advantage than in our outer harbor when completed. There is one thing that is essential to the proper utilization of this outer harbor, which the government cannot supply, but which you gentlemen should see is supplied, and that is a broad highway on land extending the length of the harbor, by means of which access to every foot of its front would be provided and available for all the railroads centering in Buffalo, as well as for wagons and trucks."

To Select Steamboat Inspectors.

The United States civil service commission announces that on Feb. 15, 1898, an examination will be held at Washington, D. C., and other cities throughout the United States, for the positions of local inspectors and assistant inspectors of hulls and boilers of steam vessels in the steamboat inspection service, treasury department. Among the vacancies which will be filled as the result of this examination is one at Buffalo at a salary of $2,250 per annum, and one at Memphis at a salary of $1,200 per annum. Attention is invited to the fact that it is the practice of the department to appoint only residents of the district in which the vacancy exists. This examination is open, however, to persons residing in any steamboat inspection district in the United States.

Applicants for local inspector of hulls at seaboard ports must have had at least five years' actual practical experience as master or chief mate of sea-going steam vessels within the seven years next preceding the date of application, and those for interior ports must have had at least five years' actual practical experience as master or first-class pilot of steam vessels on inland waters within the seven years next preceding the date of application. The qualifications for assistant inspectors of hulls are the same as those for local inspectors, except that the time of service must have been at least three years within the five years next preceding the date of application. Attention is invited to the fact, however, that at the post of New York some of the positions of assistant inspector of hulls do not require a knowledge of sea navigation, and for these there are necessary only the requirements for inland port positions. While at this port, therefore, the subject of sea navigation will be optional; applicants are informed that, in all probability, selections will be made of those who have shown a knowledge of sea navigation, and they are advised to take this subject in order to increase their prospects of appointment.

Applicants for local inspector of boilers must have had at least five years' actual practical experience as first-class engineer of steam vessels within the seven years next preceding the date of application, under United States license of the highest grade granted on the waters upon which he has been so employed. The fact that they have been so licensed must be of record in the treasury department. Applicants must be physically able to enter a boiler through a man-hole 9 by 15 inches, as required by rule 2, section 21, rules and regulations of the board of supervising inspectors of steam vessels. The qualifications for assistant inspector of boilers are the same as those for local inspector, except that the term of service required under license must be three years within the five years next preceding the date of application.

In any case, however, the experience of the applicant must have been under a United States license of the highest grade granted upon the waters on which the applicant has been employed. The fact that the applicant has been so licensed must be of record in the treasury department. Applications will not be accepted from persons under twenty-five or over fifty-five years of age, and applicants must be physically sound and free from color blindness. The examination will consist of a light educational test together with practical questions. Persons desiring to enter this examination should at once write to the United States civil service commission, at Washington, D. C., for application blanks, forms 304 and 363, which should be properly executed and promptly forwarded to the commission. No applications will be accepted after the hour of closing business on Feb. 7, 1898.

Each year at this season the Berlin Iron Bridge Co. of East Berlin, Conn., gives an "oyster roast" at its works to employees and friends of the company. This year the proprietors of trade journals in different parts of the country have been invited to the feast.

Travel at holiday rates via the Nickel Plate road, Dec. 24, 25 and 31 and Jan. 1. Tickets are good returning until Jan. 4, 1898. 406—Dec. 31

American System of Tows.

The success that has attended the use of large tow barges in the lake trade and on the Atlantic coast, especially since steam towing machines have been applied to this service, is attracting attention in all parts of the world. Mr. Frank S. Manton of the American Ship Windlass Co., Providence, R. I., sends to the Review a copy of a letter from a shipping firm in Denmark, requesting full information regarding the barges and the kind of steamer used in towing them, as well as particulars of the steam towing machines and the extent to which they are used. The letter, which deals with the subject on a broad scale, was prompted by a report on the American system of tow barges made by the Swedish-Norwegian consul-general at Hamburg, who was greatly impressed with the capacity of tows used in the lake and Atlantic coast trades and with the advantages derived from the use of the steam towing machines.

The Swedish consul writing to his government says: "Owing to the fact that the system of tows, or lighter traffic, has hitherto played a most prominent part in North America, I have gathered some details from a competent shipper, who for several years has been trading on the east coast of the United States and has studied the matter thoroughly. According to his reports the transportation of coal in these vessels is in full swing between Sidney (Cape Breton) and Montreal, and between Boston, Philadelphia, Baltimore and Portland. In 1895 a lighter was towed from Philadelphia even, as far as the West Indies and returned with a cargo of sugar. There are used partly dismasted sailing ships of 1,500 to 2,000 tons, the 'tween decks of which are taken out; partly so called whaleback barges, flat bottomed steel lighters of about 2,000 tons burden and drawing 15 feet; the latter are considered to have the best prospects. A single steamer can tow up to three such barges. Of late, sea-going lighters have been extensively employed on the coasts of North America, and will, according to this named captain's opinion, soon be the principal means of transport on the coast. A problem, which maybe will soon be solved, is the employment of lighters in the transport of goods across the Atlantic. It appears from various professional papers that it is specially the bursting of the towing rope in rough weather which has caused difficulties. But in order to protect the rope, it is contemplated to make use of an apparatus, which, according to the statements of the papers, has proved most efficient on the great American lakes. It consists of a roll on which the rope is wound up. By means of an ingenious mechanism the roll causes the rope to slack when the tug is setting heavily in the sea and threatens to break the rope, whereas, when the pressure on the rope is getting less, it winds itself up again into its previous position."

Following up this report the Swedish shipping firm is in search of a systematic collection of information on the subject of barge traffic. That they intend to go into the subject very thoroughly is indicated by the following questions which they ask regarding the barges: Of what material are they generally built; what is the common size and draught of water; what is the price per regular ton, or per ton dead weight capacity; name some of the most prominent ship yards where these lighters are built; what is the size and horse power of steamers required to tow the lighters; how many lighters are towed at the time; what speed can they make; do they really go as far as Havanna, etc., from New York; how do they pull through in open sea in case of rough and stormy weather; do they carry all kinds of merchandise to the satisfaction of the merchants; can they carry goods at lower rates of freight than competing steamers and sailers; what is the number of hands on board; state insurance premiums charged by American underwriters for goods shipped in such lighters; state insurance premiums charged by American underwriters for the lighters themselves; state insurance premiums compared to the rates charged for ordinary steamers and sailors.

Although the Roberts Safety Water Tube Boiler Co. of Red Bank, N. J., and 41 Cortlandt street, New York, has a very large works devoted exclusively to the manufacture of marine water tube boilers, the plant is engaged on orders that will tax its capacity for at least three months to come. Among these orders are the following: For the Maytham steel tug to be built by the Union Dry Dock Co., Buffalo, 1,200 horse power; for the New York and Sing Sing passenger and freight steamer Sarah A. Jenks, 1,000; for a steam yacht building by the Erie Basin Dry Dock Co., New York, for E. W. Bliss, former owner of the yacht Elba, 1,200; for the Elba, 1,400. The Buffalo tug building at the works of the Union Dry Dock Co. will be used for towing scows against an 8-mile current on Niagara river, and will be constructed with a view to this special service, which requires a powerful tug and which is in connection with the Buffalo breakwater contract. The big dredge just completed at Buffalo for the breakwater work is also fitted with Roberts boilers of about 1,000 horse power, which were specified on account of the success of boilers of the same type in one of Dunbar & Sullivan's dredges. A duplicate contract for dredge boilers was also secured recently. The list of orders also includes several small boilers to be used on the Yukon and the lake district of Alaska, as well as a boiler for a new electric light plant at Fort Fisher on the North Carolina coast. The Roberts company reports a total of 889 boilers built to date.

James A. Adair, general superintendent of the works of the Harlan & Hollingsworth Co. at Wilmington, Del., has been visiting lake ship yards with a view to noting anything in the way of methods prevailing here that might be of advantage on the coast.

William H. Jaques, well-known engineer and naval architect, formerly with the Bethlehem Iron Works, has accepted the presidency of the John P. Holland Torpedo Boat Co., New York.

Holiday rates are available on the Nickel Plate road, Dec. 24, 25 and 31 and Jan. 1, returning until Jan. 4, 1898. 403—Dec. 31

Holiday excursions via the Nickel Plate road Dec. 24, 25 and 31 and Jan. 1, returning until Jan. 4, 1898. 405—Dec. 31

Army and navy charts for the lakes are kept in stock by the Marine Review, Perry-Payne building, Cleveland.

Around the Lakes.

Capt. J. P. Devney will build at Ashtabula during the winter a wooden tug 80 feet over all, 18 feet beam and 10½ feet depth.

At the South Chicago coal yard of E. L. Hedstrom recently 3,179 tons of coal were taken out of the steamer Chili in 16 hours 45 minutes.

A cargo of 320,000 bushels of oats delivered at Buffalo from South Chicago, a few days ago, by the Mutual line steamer Coralia was loaded in about 12 hours.

Onondaga is the name selected for the second revenue cutter building at the ship yard of the Globe Iron Works Co., Cleveland. This vessel will be launched in afew days.

In about 10 hours on Thursday last 5,037 tons of soft coal was transferred from cars at the Cuddy-Mullen dock, Cleveland, to the steamer Rees, which was the last vessel to load for Lake Superior.

The first charters for boats to hold grain during the winter at Chicago and carry it to Buffalo next spring have been made. The rate starts in at three cents. This is somewhat less than had been hoped for by vesselmen.

The Duluth, Mesabi & Northern railway ore dock on St. Louis bay, at Duluth, is to be extended 576 feet, at a cost of $100,000. The work will be done by the Barnett & Record Co. of Minneapolis. The ore dock on Alouez bay, Superior, will also be enlarged to a capacity of 60,000 tons.

Lieut. J. F. McIndoe, corps of engineers, U. S. A., has taken charge of the government operations at Sault Ste. Marie under direction of Lieut. Col. G. J. Lydecker, in place of General Superintendent E. S. Wheeler, who recently accepted the position of chief engineer of the Nicaragua canal commission.

John Jamieson, aged fifty-five, engineer of the steamer City of Chicago of Benton Harbor, Mich., died suddenly at the Hotel Wabash, in Detroit, Monday afternoon. The death of another well-known engineer, Owen Williams of Detroit, was announced from Chicago on Sunday last. Mr. Williams, who was seventy years of age, slipped from a ladder while going aboard the steamer Mecosta, on which he had been chief enginer for several years. He feel into the river and contracted a cold that resulted in pneumonia.

A Washington dispatch states that Gen. Wilson, chief of government engineers, still maintains the position which he held while in Chicago, that congress has authorized the dredging of the Chicago river to a depth of 16 feet only. He does not see any use in dredging the river to a greater depth while the tunnels remain at their present height. He says it rests with the citizens of Chicago to decide whether the tunnels shall be lowered, which means that the city must bear the expense attaching to such a gigantic undertaking.

Lieut. G. H. Stafford, U. S. N., of the branch hydrographic office, Cleveland, says in a note to the Review: "Referring to an item that appeared in the columns of the Marine Review to the effect that Lieut. H. K. Hines, U. S. N., would come to the Cleveland branch hydrographic office before assuming charge of the branch office to be opened at Duluth, I have now to inform you that the navy department has revoked the order to Lieut. Hines, and the opening of the Duluth office will be delayed until another officer has been found for that duty."

The steel steamers L. C. Waldo and Fayette Brown are to hold their coal cargoes at Milwaukee until the rush at the docks is well over. After they have got rid of their freight they will follow each other into the stationary dry dock at the south yard for permanent repair of touch-and-go damage suffered through the season just ended. The jobs are the first of the kind received by the Milwaukee Dry Dock Co. since the establishment of its steel plant. Repairs on the steel steamer S. R. Kirby and steel tow barge Hartnell will be made at South Chicago. The Harvey Brown, of the same fleet, will get repairs at Detroit.

The United States court of appeals has sustained the decision of the district court at Duluth in the case of the owners of the steamer Nyanza against a cargo of coal that the vessel delivered at the port of Duluth in 1895. The decision was in favor of the vessel owners. The vessel met with an accident while on the way to Duluth, and as a result the cargo of coal was damaged by water. The consignee, the Pioneer Fuel Co., declined to accept the coal and the vessel was detained awaiting some disposition of the coal. The court awarded the vessel demurrage to the amount of $100 a day for eight days. The court held that under the bill of lading the coal company was bound to accept the cargo.

Contracts for several yachts and other small craft are announced by the Racine Boat Mfg. Co. of Racine, Wis. A steel yacht for Otto Young of Chicago, to be used on Lake Geneva, will be of the following dimensions: Length, 75 feet; beam, 12 feet; draught, 4 feet, and guaranteed to make 14 miles an hour. The boat will be finished throughout in mahogany, and will have a triple expansion engine. A boat for Martin A. Ryerson of Chicago will be 75 feet over all, 12½ feet beam, and 4-foot draught. There will be 28 feet of clear deck room. It will cost $12,000. The company is getting out several boats to be used by parties interested in the Klondike regions. They will be constructed of steel and in water-tight sections.

The Northern Steamship Co. is looking over the ground and counting the cost of lengthening the freight steamers of the line, putting 45 feet or more into the middle of each of them. It is possible that the project may be given up altogether, for it all rests on the simple proposition whether the additional carrying capacity will meet the cost and afford a good margin. The company will spend considerable money on the work—if it is done—as the boats will not merely be given a certain number of feet additional, but will be practically reconstructed so that there will never be any question as to their strength. It looks now as though the cost would be too great to warrant the undertaking, and if such proves to be the case the project will be dropped.—Buffalo Exchange.

U. S. ENGINEER OFFICE, DULUTH, MINN., Nov. 30, 1897. Sealed proposals for building substructure for south pier, Duluth Ship Canal, will be received here until noon, Jan'y 15, 1898, and then publicly opened. Information furnished on application. Clinton B. Sears, Major, Engrs. jan. 15

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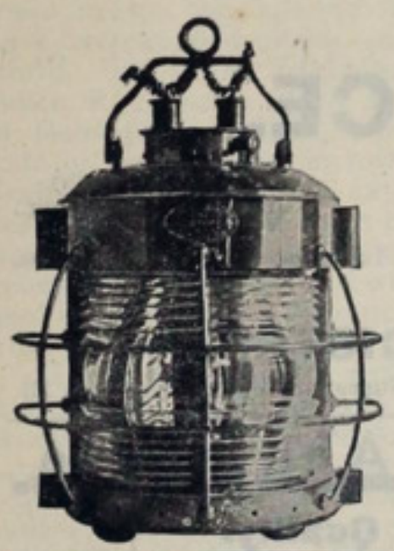

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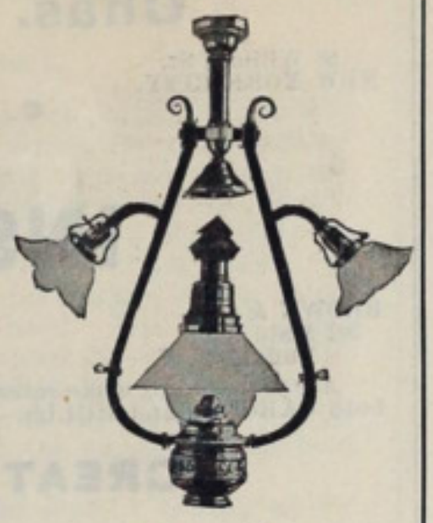

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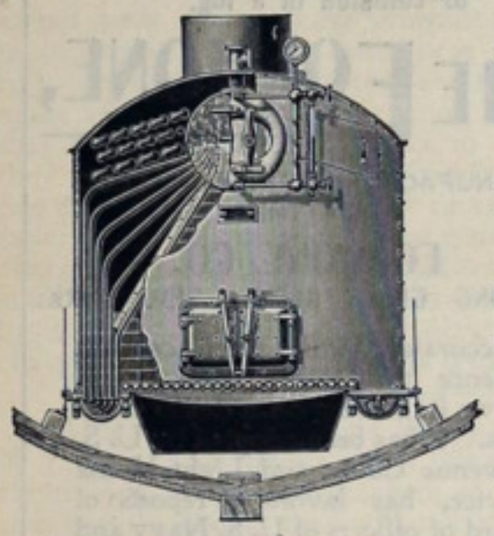
For all types of Steam Vessels and Stationary Plants.



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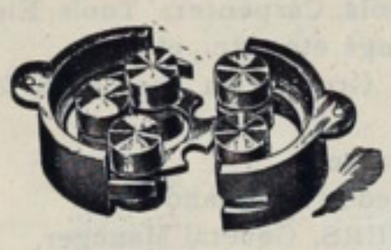

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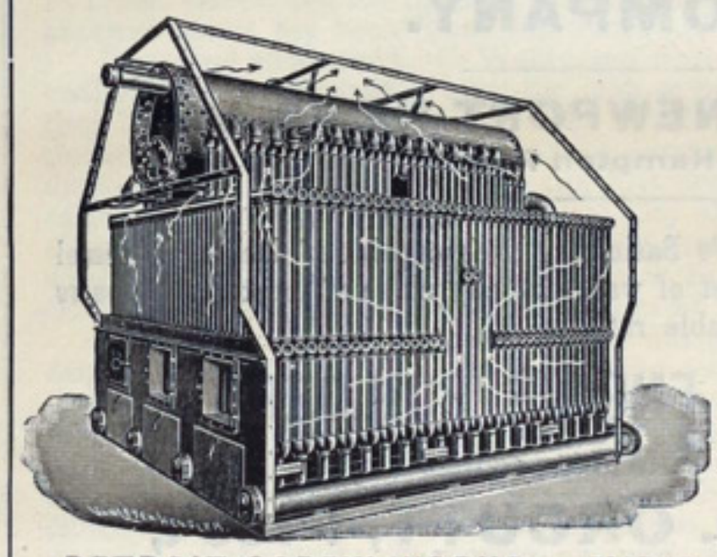

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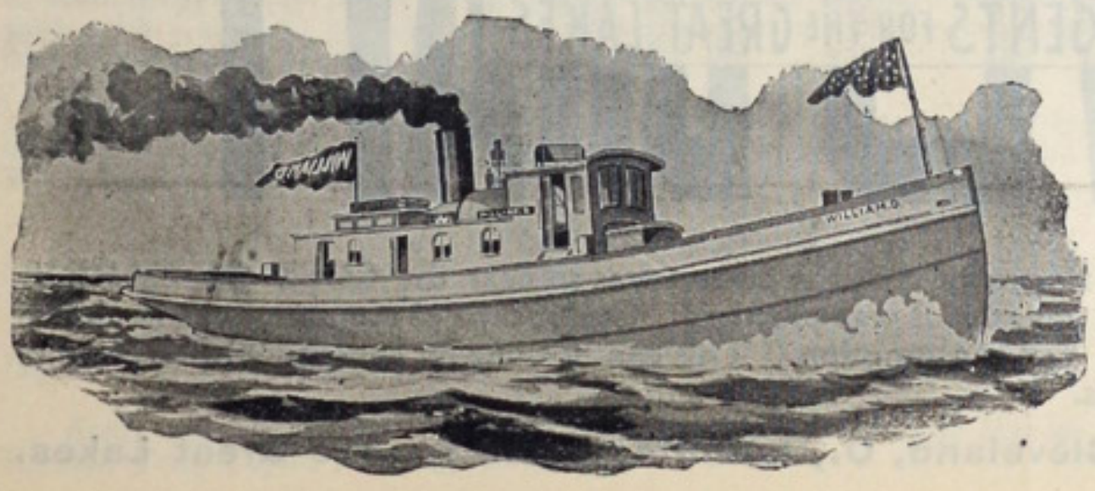

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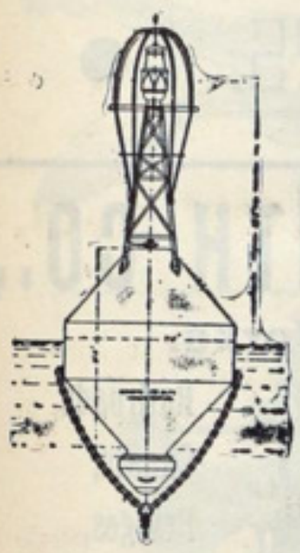

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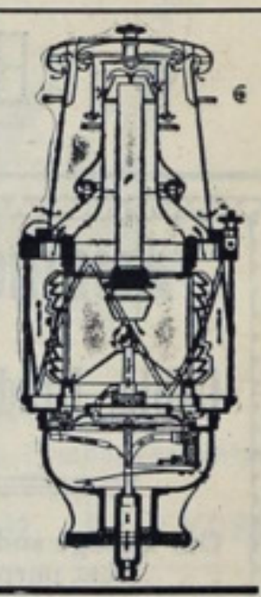

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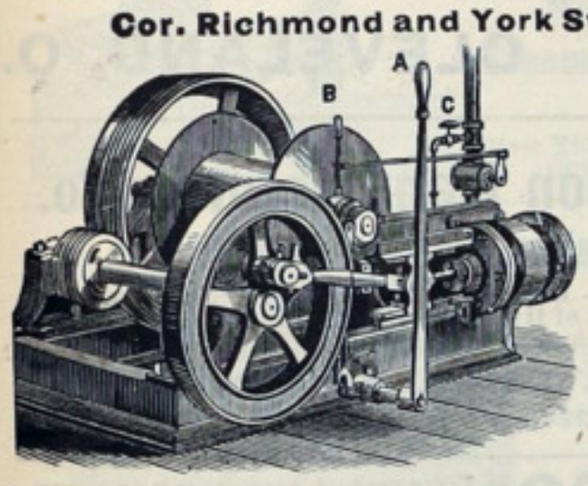

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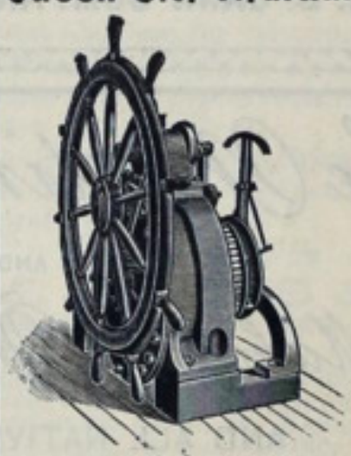

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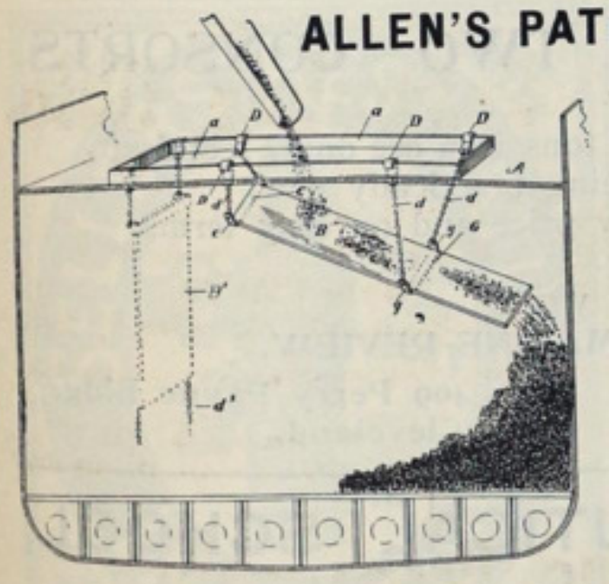

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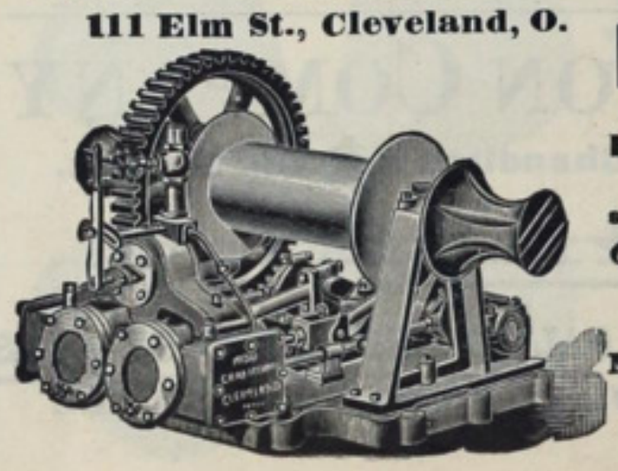

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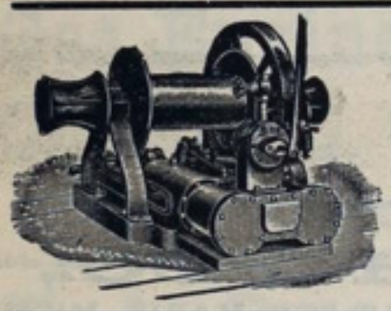

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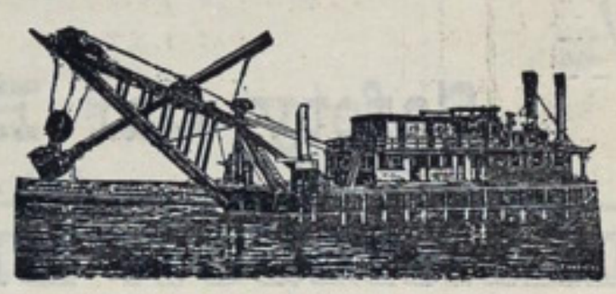

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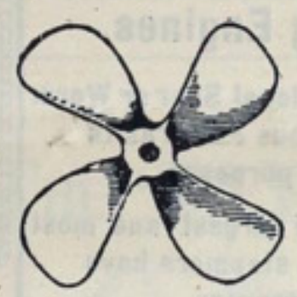

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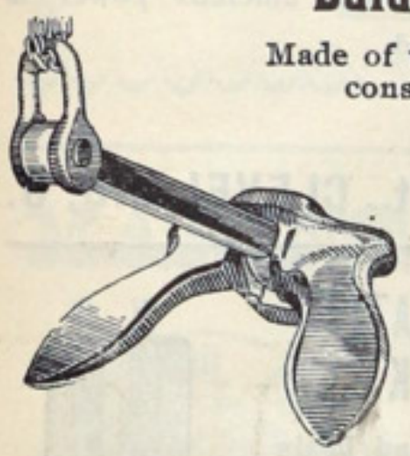

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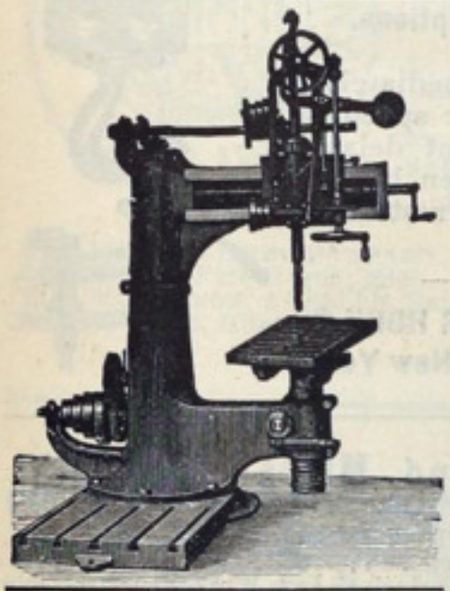

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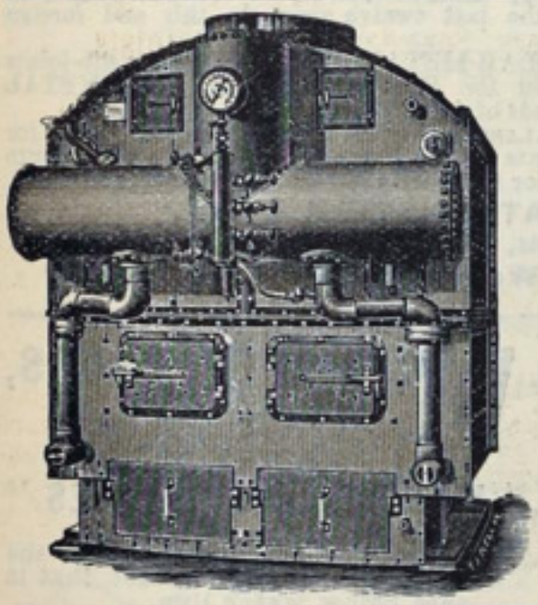

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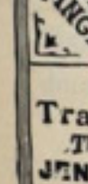

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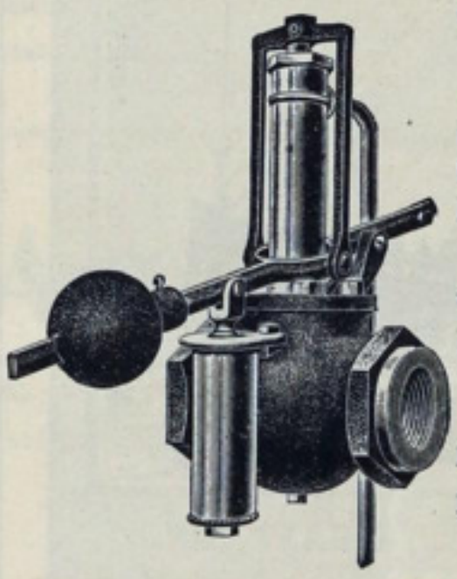

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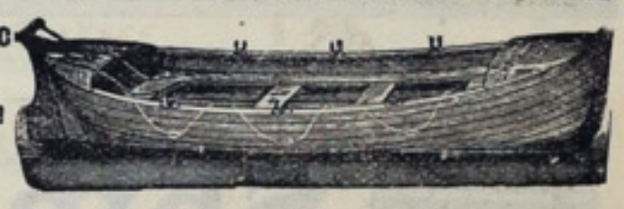

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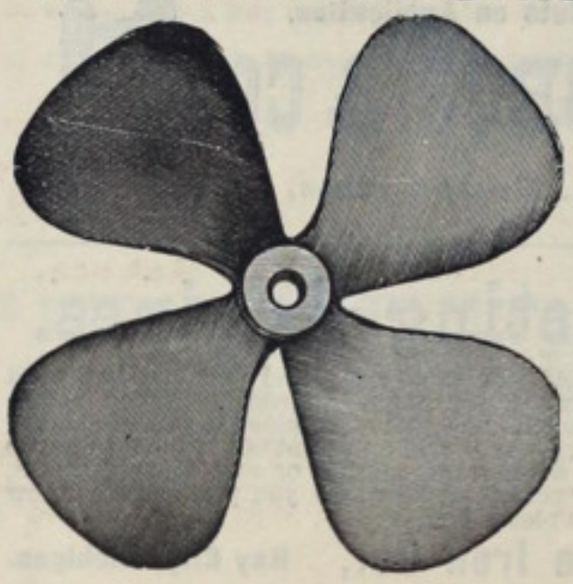

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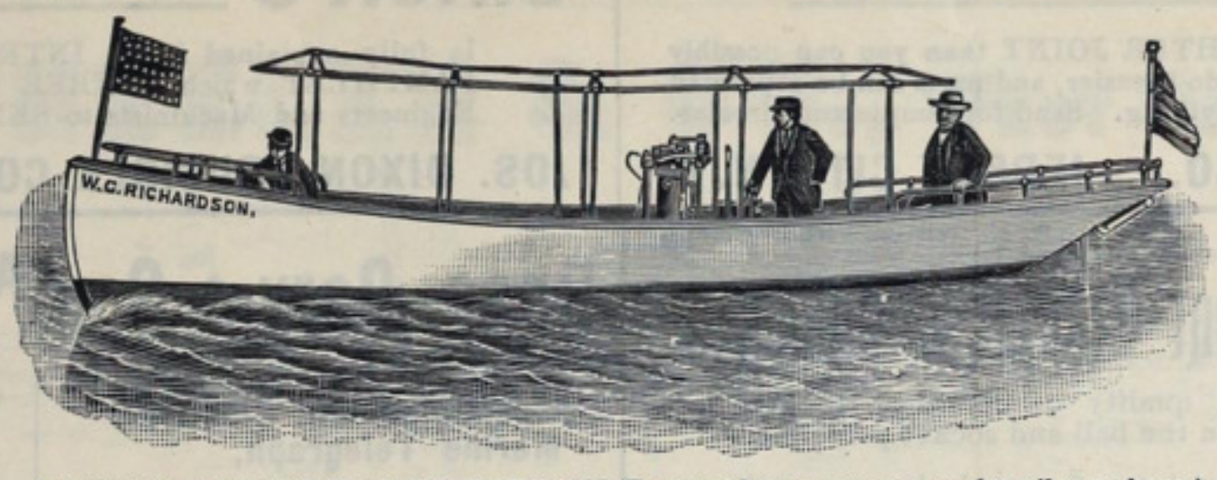

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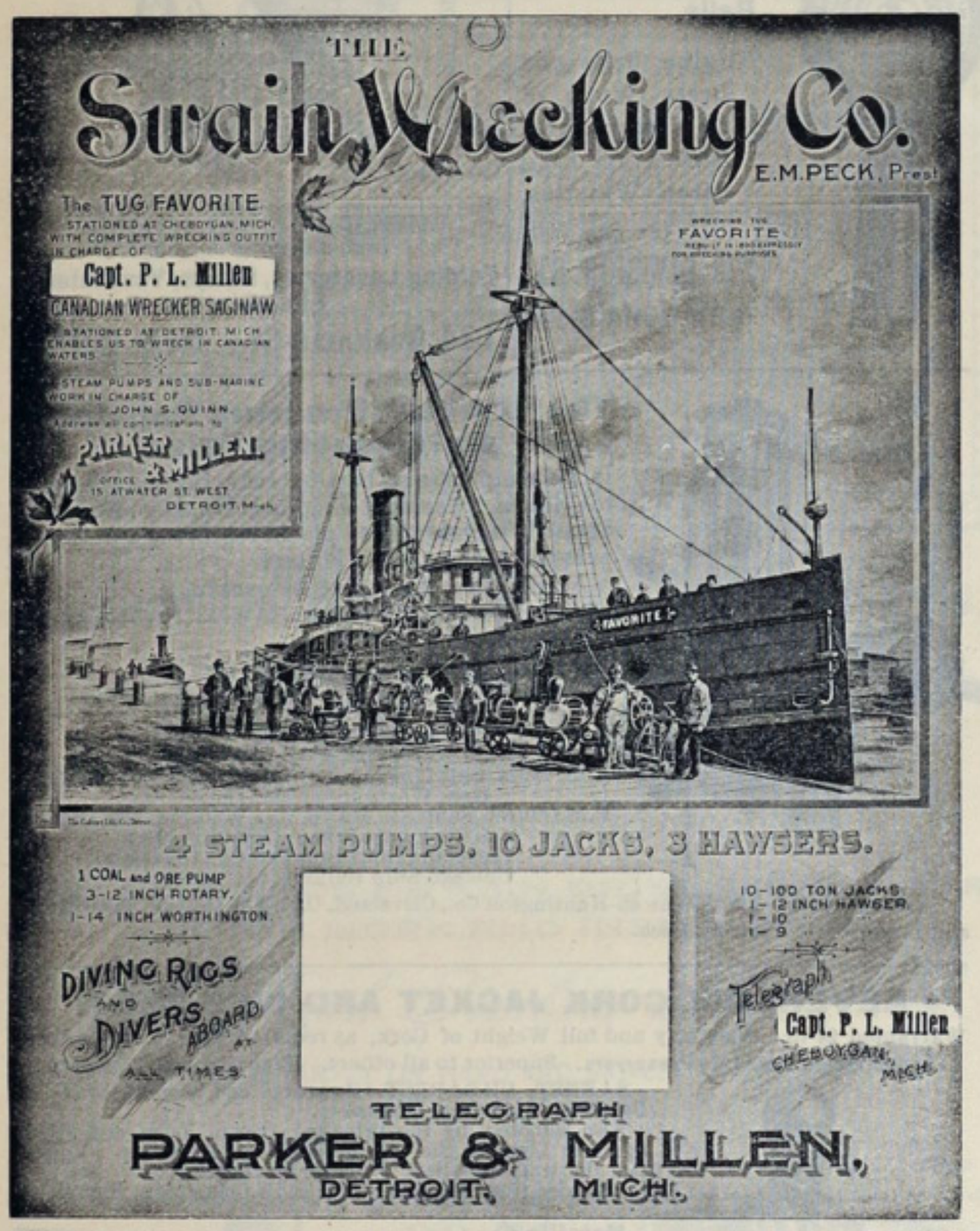

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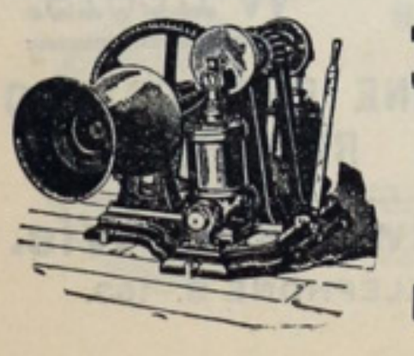

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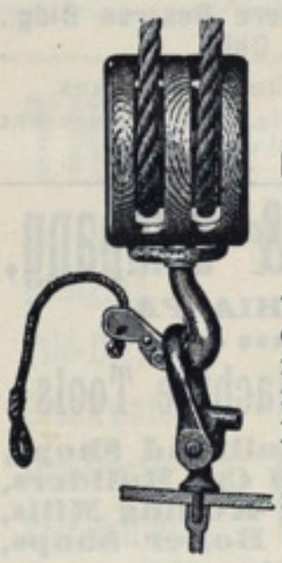

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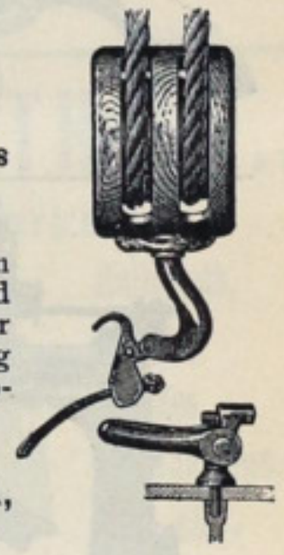

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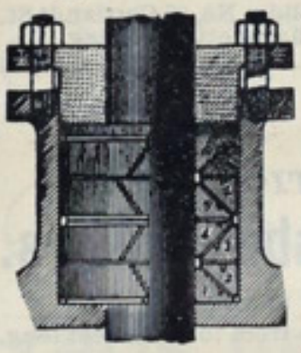

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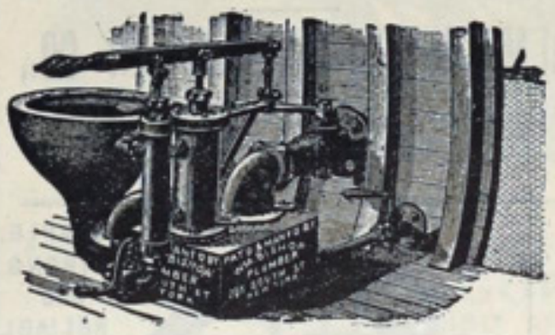

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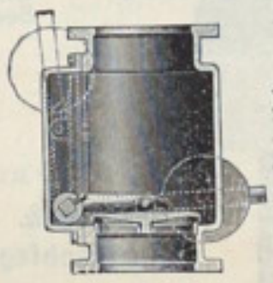

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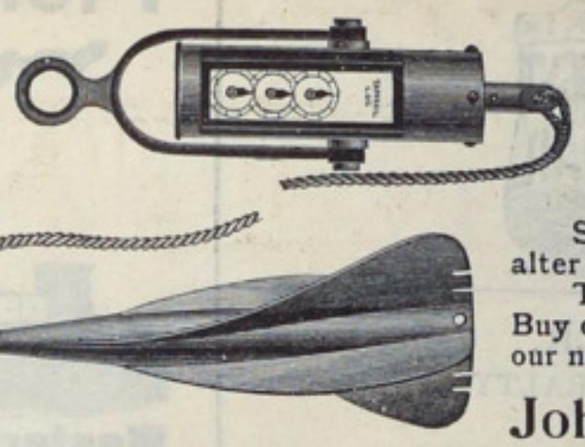

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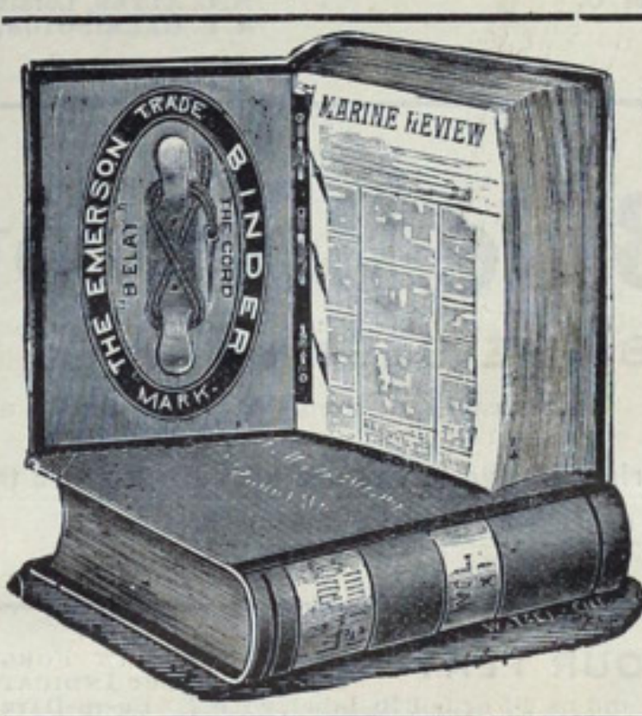

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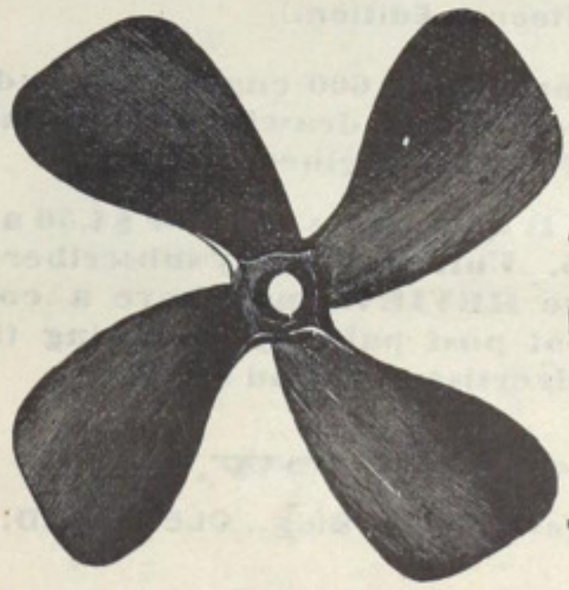

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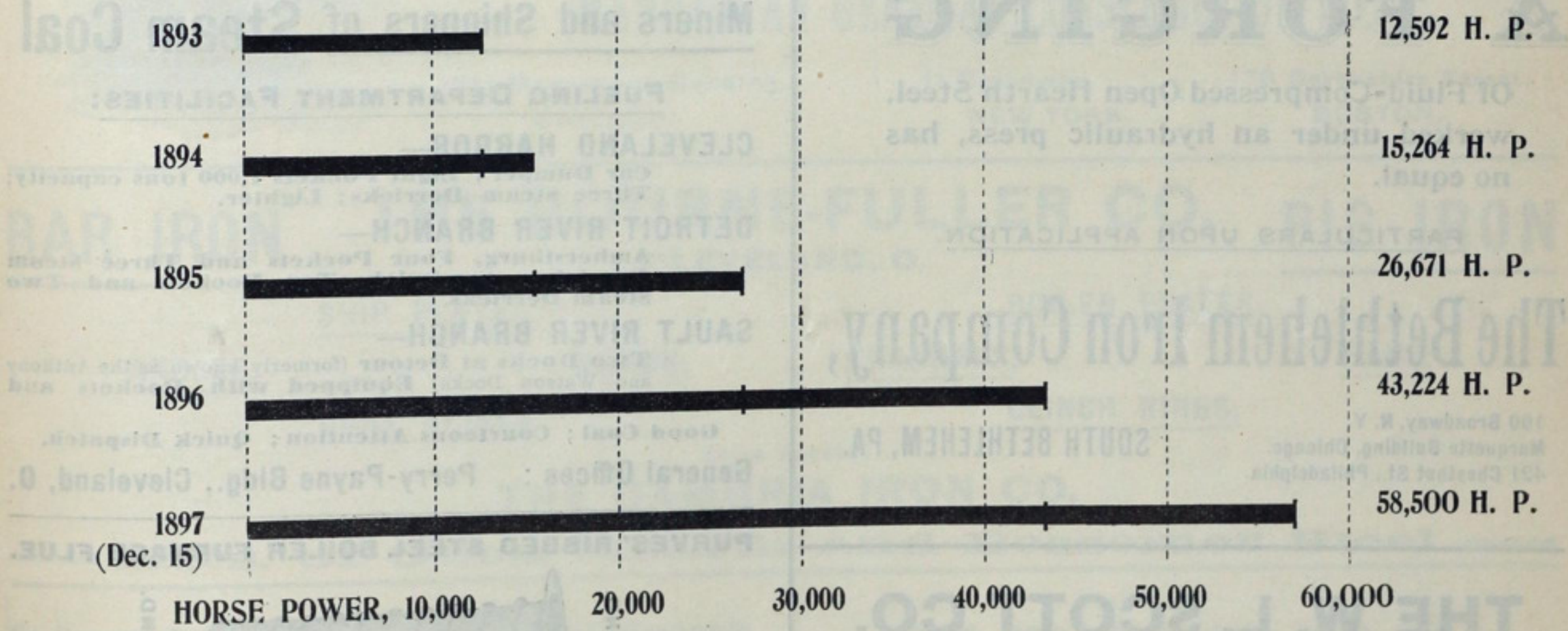

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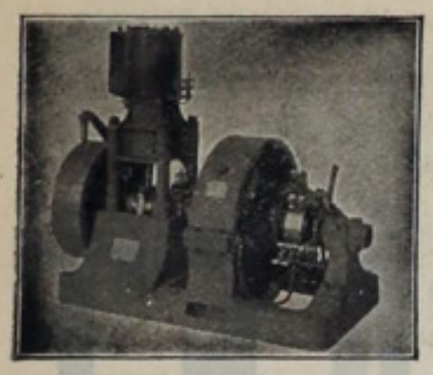

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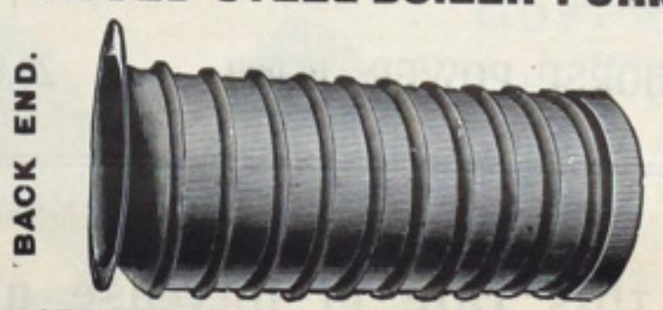

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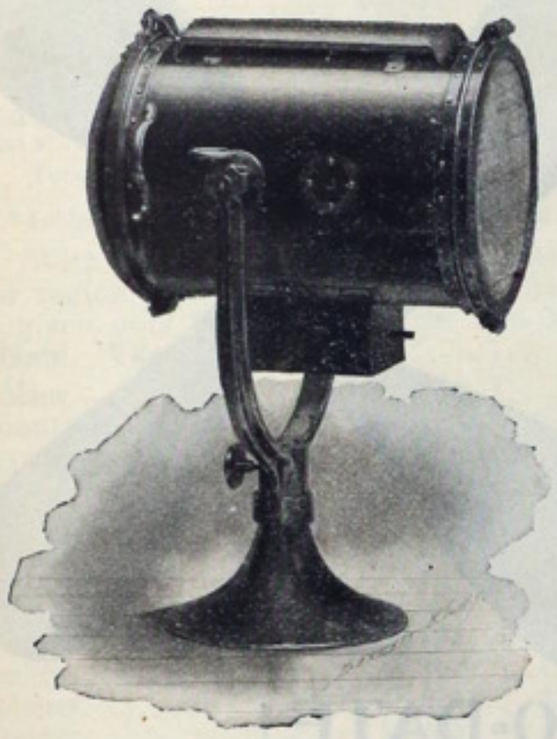

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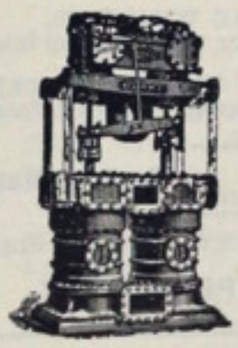

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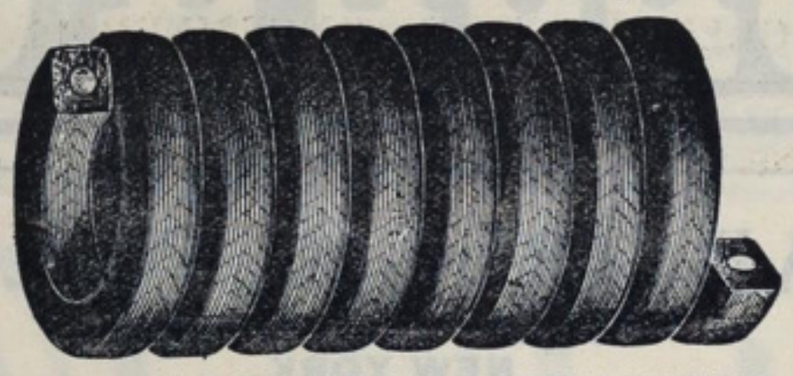

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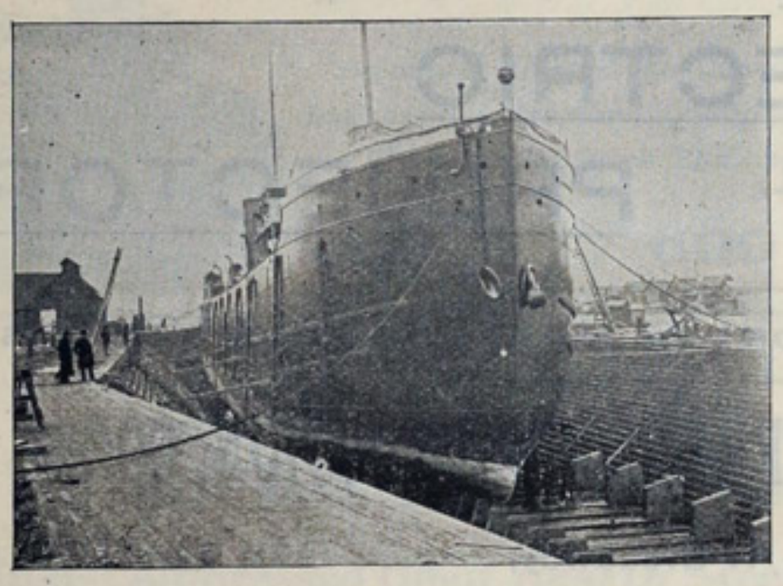

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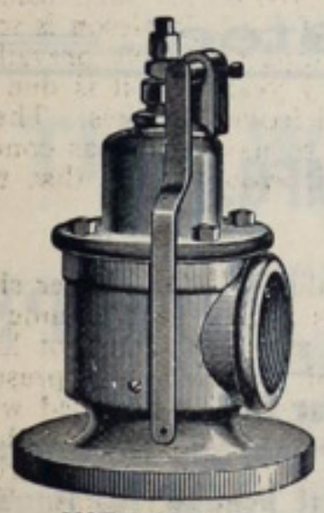

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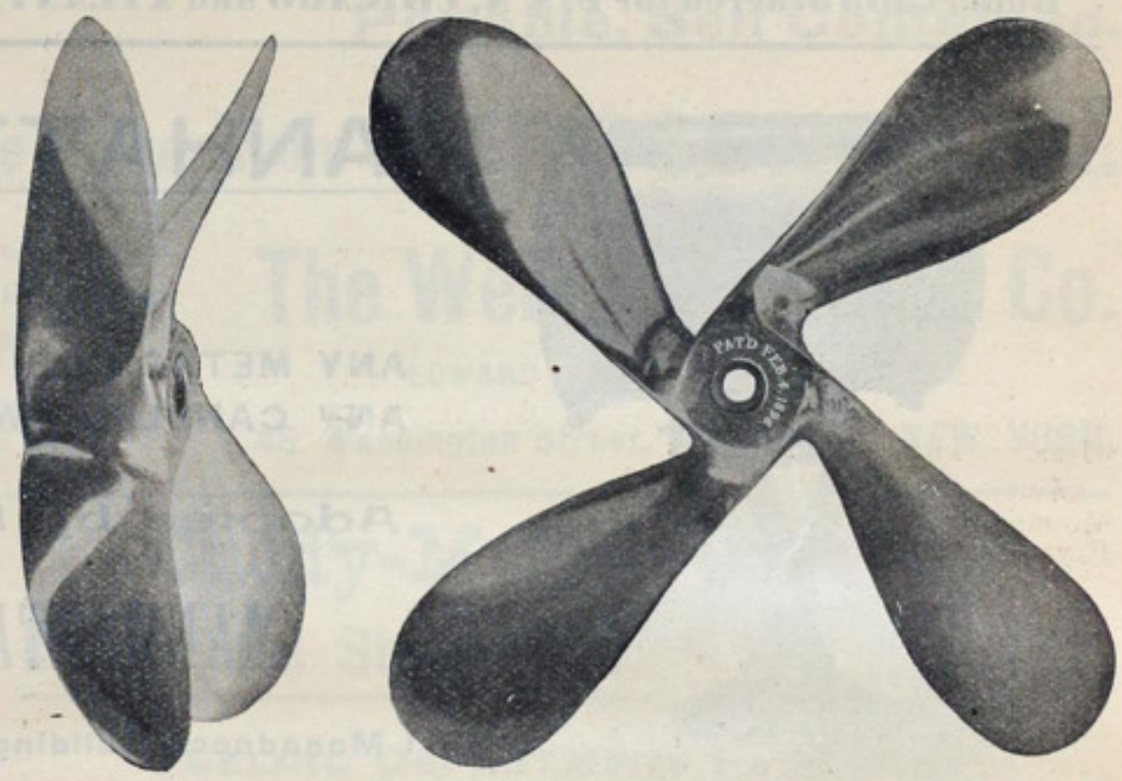

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THE PHOSPHOR BRONZE SMELTING CO. LIMITED, 2200 WASHINGTON AVE., PHILADELPHIA.
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INGOTS, CASTINGS, WIRE RODS, SHEETS, ETC.
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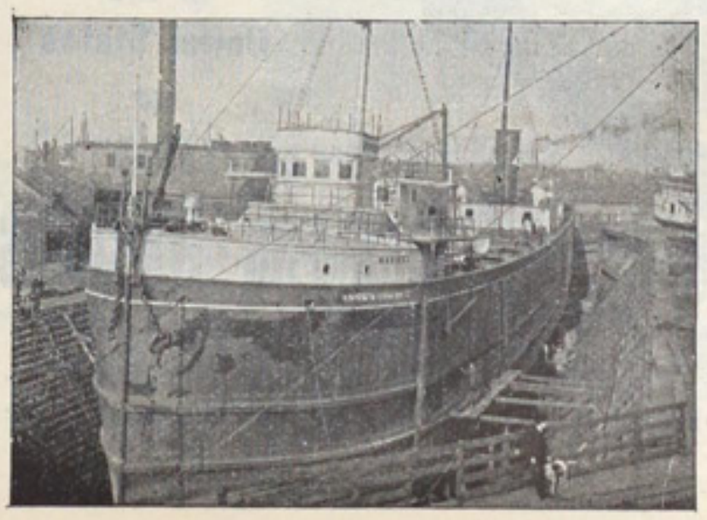
CASTINGS. STAMPINGS AND FORGINGS.
ORIGINAL AND SOLE MAKERS IN THE U.S.

PROPELLERS.

The Cleveland Dry Dock Co.



148 Elm St., Cleveland, O.
Telephone 1616.
Resid. 'Phone 3634.

REPAIRING A SPECIALTY.

Dimensions of Dock:
Lth. over all, 360 ft.
Lth. on blocks, 340 ft.
Width of gate, 50 ft.
Depth over sill, 20 ft.

Capt. W. W. BROWN, Sec'y & Mgr.